NOTE: This draft, dated 10/22/01, prepared for the Automated Data Conversion Strategy has not been approved and is subject to modifications. DO NOT USE PRIOR TO APPROVAL. (Project)

PROGRAM MANAGERS IMPLEMENTATION GUIDE (PMIG)

Prepared by Hampton University &
Global Technology LLC for
Integraph Corporation. Contract # N66032-94-D-0012

EXECUTIVE SUMMARY

The Program Managers Implementation Guide (PMIG) provides Program Managers with understanding of the technical and business related issues addressed while creating a successful strategy for document conversion. The PMIG is a product of the Department of Defense's (DoD's) Plan for bulk data Conversion. Use of the PMIG will provide a unified approach for converting technical engineering data to required formats. It assists in the establishment of a standards-based, neutral framework. Because the formats included in the Guide are predominately "neutral", it accommodates interoperability of numerous users despite differing hardware and operating systems.

This document will initially articulate the strategy that will enable DoD to reach the goal for completing conversion of technical documents required for maintenance and material management, depot maintenance, and training support, and drastically reduce the need for sustained conversion. This document will address the specific technical engineering data requirements for converting engineering drawings and other graphics within technical data. A Document Conversion Strategy to specifically address text data requirements will follow.

Using the guidelines established by the DoD Master Plan for Conversion (Automated Document Conversion Master Plan version 1.0 by Office of the Assistant Secretary of Defense ((Command, Control, Communications, and Intelligence/Information Management), it is the intent of the Department that all technical and acquisition related documents determined to be active will be available in a useful digital format. The minimum digital format would be at the raster level. Digital data must support all stakeholders in the weapons system acquisition life cycle. These stakeholders include two distinct communities: the authors and managers of technical documentation who are responsible for ensuring that technical data is current and can be referenced to a particular weapon system; and the users of the documentation who use its content to effect repair, maintenance, or acquisition actions in support of a particular weapon system.

For the past several years the Services have actively pursued the conversion of technical documents to useful digital formats. To complement these ongoing efforts, the Data Conversion Strategy is based on achieving the following:

? Getting the right data, to the right user, at the right time in a useful format to meet mission needs;
? Capitalizing on existing conversion achievements to complete the conversion process for document; and
? Capitalizing on the storage and output processes currently in place.

DoD's goal is to fully satisfy this direction and has made significant progress in doing so. DoD plans to:

? Establish a comprehensive conversion capability to support the logistics and engineering community, and
? Use conversion operations to convert legacy data to formats usable in todays and future business processes.

As Automated Document Conversion projects are selected and funded the use of this document will assist in determining the data file formats to specify to support functions, and will promote data management and the metadata necessary to support those functions.

The Guide Specifications:

While a Performance Specification defines the contractual requirement of the conversion contractor, the PMIG gives guidance to the Program Manager in suggested methods, procedures, and processes to follow in creating a Performance Specification. Concurrent use of the Guide and Performance Specification Template is recommended. By doing so the user will achieve consistency and will be less likely to cause confusion between conversion contractors and Program Managers.

The PMIG is intended to be used in conjunction with the **Data Conversion Strategy Performance Specification Template** (appendix F). The Document Conversion Strategy Performance Specification Template provides the DoD with a unified approach for raster to vector conversion of engineering drawings. It assures that the converted data supports a standards-based, neutral framework, and it accommodates interoperability of differing hardware and operating systems.

The PMIG provides Program Managers with understanding of the technical issues addressed while creating a successful strategy for document conversion. The PMIG provides the means to incorporate this strategy into the Document Conversion Strategy Performance Specification Template, creating the project-specific Performance Specification.

The activities included in this Guide provide techniques for thorough investigation of the user's infrastructure, evaluation of existing documents, a means for format selection, an analysis of metadata, a process for tracking documents through the conversion process, and a method for conversion validation. In addition, a **User Worksheet** (e.g. see Appendix F) is included to provide a concise method for recording activity results.

The Document Conversion Strategy Guidance Specification can be completed in one of two methods. The user may be guided through the process using the **Project Related Information Management and Execution (PRIME Software Wizard)** or may choose to edit the Document Conversion Strategy Guidance Specification in Word97 format. PRIME is the software equivalent of the Word97 format. Both processes will provide consistent output: A project specific Performance Specification, including a recommended conversion format. The Performance Specification will be given to the contractor with the corresponding **Detailed Definition Package**.

The process for using PRIME is concise. This assistant consists of a series of drop-down menus will guide the user through the Guide activities. If a question is "asked" that the user is unprepared to answer, PRIME will allow the user to exit and save the data.

This Page Intentionally Left Blank

Table of Contents

PART I

1.0 SCOPE …….. 8

1.1 Scope……8
1.2 Organization of the PMIG…….. 9

2.0 APPLICABLE DOCUMENTS…….. 11

2.1 General……... 11
2.2 Other Government documents and Procedures…….. 11
2.3 Non-Government Publications…….. 12
2.4 Order of Precedence…….. 12
2.5 ISO 10303 (STEP) Overview……. 12

3.0 DEFINITIONS AND ACRONYMS……. 14

3.1 Acronyms…… 14
3.2 Definitions…….. 14

4.0 BUSINESS CONTEXT……... 14

5.0 DOD CONVERSION ENVIRONMENT…….. 15

PART II

6.0 CONVERSION STRATEGY…… 16

7.0 MANAGEMENT COMPONENT OF CONVERSION STRATEGY….. 16

7.1 Information Access and/or Dissemination…… **18**
7.2 Archived Converted Document…… **18**
7.3 Managing Converted Documents…… **18**
7.4 Records Management Requirements for Converted Documents as Organization Records…… **19**
7.5 Records Management Requirements for Original Documents as Organization Records…… **20**
7.6 Other Issues…… **20**
7.7 Business Case Decision Table…… **21**

8.0 CONVERSION OBJECTIVES…… 23

8.1 Data Conversion Strategy Concept……. **23**
8.2 Concept of Operations…… **25**

PART III

9.0 DOCUMENT CONVERSION PROCESS……. 29

9.1 Determining conversion requirements……. 31
9.2 Identify Document Type…….. 31
9.3 Determine Number by size…….. 32
9.4 Delivery Schedule……. 35
9.5 First Article Block……. 35
9.6 Contractor Acknowledgement of block…… 35
9.7 First Article block return…….. 36
9.8 Validation……. 36
9.9 Validation of First Article Blocks…… 37
9.10 First article conversion unsuccessful…….. 37
9.11 Select New Contractor…… 38
9.12 Validation of second and subsequent blocks…….. 38

10.0 PRIME WIZARD……. 38

10.1 Using the Project Related Information Management and Execution PRIME……. 38

11.0 BACK END PROCESS……. 47

12.0 WORKSHEETS……. 48

PART IV

13.0 APPENDIX A ACRONYMS……. 49

14.0 APPENDIX B DEFINITIONS…….. 51

15.0 APPENDIX C DATA CONVERSION FORMAT DEFINITIONS…….. 59

16.0 APPENDIX D DETAILED DEFINITION SPECIFICATION…… 61

17.0 APPENDIX E PROJECT RELATED INFORMATION MANAGEMENT AND EXECUTION…… 77

18.0 APPENDIX F DOCUMENT CONVERSION STRATEGY USER WORKSHEET…….82

19.0 APPENDIX G METADATA FILE STRUCTURE……. 84

20.0 APPENDIX H DOCUMENT CONVERSION STRATEGY SHIPPING FORM……...88

21.0 APPENDIX I DOCUMENT CONVERSION STRATEGY DELIVERABLE SCHEDULES…….89

22.0 APPENDIX J DOCUMENT CONVERSION STRATEGY FIRST ARTICLE VALIDATION FORM…….90

23.0 APPENDIX K VALIDATION METHODS AND SIGN-OFF SHEET.. 91

24.0 APPENDIX L VALIDATION TABLES…… 94

25.0 APPENDIX M TASK ORDERDELIVERY DELIVERY FORM LETTER……. 98

26.0 APPENDIX N ENGINEERING RELEASE RECORD (ERR)…… 99

Table of Figures

FIGURE 1 DOCUMENT CONVERSION/VALIDATION FLOW CHART….29

FIGURE 2 DOCUMENT CONVERSION PROCESS…… 33

FIGURE 3 DOCUMENT CONVERSION PROCESS (cont)……. 34

FIGURE 4 PROJECT RELATED INFORMATION MANAGEMENT AND EXECUTION…….. 45

FIGURE 5 PROJECT RELATED INFORMATION MANAGEMENT AND EXECUTION (cont)…….. 46

FIGURE 6 BACK END PROCESS……. 47

LIST OF TABLES

TABLE I BUSINESS CASE DECISION TABLE REQUIREMENTS DETERMINATION…….. 22

TABLE II PMIG OBJECTIVES……. 24

TABLE III METRIC ASSESSMENT OBJECTIVES……. 25

TABLE IV DOCUMENT CONVERSION PROCESS……. 26

TABLE V ABC'S FOR EACH TYPE OF DOCUMENT……... 27

TABLE VI VALIDATION ITEMS……. 37

1.0 SCOPE

1.1 Scope

This PMIG provides:

- ? The information management business context within which documents (organization records) undergo conversion
- ? A flexible document conversion strategy
- ? Policy guidance for acquisition management of Automated Data Conversion (ADC) equipment, systems, and technologies.

This Guide provides guidance and information to DoD Project Managers, Program Managers, and individuals responsible for conversion of engineering documents in concurrence with the Document Conversion Strategy Performance Specification. The purpose is to assist in planning and implementing effective engineering document conversion activities and practices. The Guide supports acquisition of converted documents from contractors based on a project-specific Document Conversion Strategy Performance Specification developed while incorporating activities in this Guide into the Document Conversion Strategy Performance Specification Template.

The following areas must be considered when developing a business case for conversion of legacy data:

- ? **Document type**: Is the document requiring conversion composed primarily of text, graphics, or a combination of both?
- ? **Document Media**: Is the document in paper, microfilm, or other digital format? Each will affect the conversion process and costs associated with conversion.
- ? **Document Use**: Once the document is converted to a digital format, will it be used for viewing, output, or data updating?
- ? **End Users**: Who is the ultimate end user? Will the end users of the digital document be war fighters, analysts, managers, or those involved in acquisition?
- ? **Distribution Method**: Will the converted document be distributed digitally, on-line, or in paper format?
- ? **Update Requirements**: How will the document be updated and when?

Once the document and its associated use have been identified, the type of conversion required can be determined. This decision should be based on the associated cost, the availability of the conversion process, the location of conversion support services, the mode of data delivery (In and Out), and the schedule.

To ensure digital data can be stored, accessed and used after conversion takes place, significant other factors must be taken into consideration. The following are essential factors in determining the end use of digital data:

? **Integration**: What are the infrastructure requirements? How and where will the converted documents be stored? What systems required interfacing and what method of access will be used?
? **Storage:** What level of indexing will be required for document management? What are the storage requirements with regard to sizing, location, and backup?
? **Maintenance:** How will the documents be maintained? Who is responsible for update? Will multiple output formats be required?
? **Output:** What formats must the converted document be in? What media must be used and how will it be accessed?
? **Tracking Systems:** Will the conversion system be interfaced to the customer? What standards must be met? What criteria will be used for ordering and estimating the conversion process? How will the status of the conversion process be monitored and reported?

Conversion efforts continue to evolve. Technology has improved significantly to enable more intelligent documents with more sophisticated interactive linking of supporting data. For example, Commercial-Off-the-Shelf (COTS) products for organic raster to vector conversion and intelligent text conversion are readily available in the marketplace. Many of these products are easily integrated into the existing environments and are intuitive enough or are extremely user-friendly that formal training is not always required. However, not all products are homogeneous in support or capability. Therefore users must ensure that the conversion software used is compatible with their existing environment.

Studies have further indicated that the outsourcing of conversion requirements provides significant savings to DoD by allowing resources within DoD to become available for more productive work and thereby providing a more cost effective and streamlined approach to conversion of legacy documents.

While use of vectorization tools can be advantageous to many processes, a careful examination of appropriate levels of data forms is required. Determining the actual use of the information will provide data managers with knowledge of appropriate levels of conversion. Vectorization provides an intelligent two-dimensional attribution of data; however, a three-dimensional product model is often required to allow for automated re-tooling of weapons systems piece parts.

Thus, accommodating existing business needs has dictated that a "menu" of conversion alternatives be made available to support business requirements as well as the financial constraints of reduced funding levels. Six drawing conversion levels, from simple to complex, have been defined. It should be noted that each of these format levels has a particular place in a conversion strategy. The format level of conversion is primarily based on the ultimate use of the data and the relative costs associated with the level of conversion. These conversion format levels include:

- **Level 1 - Raster Image:** A scan of the original drawing, which converts the drawing into a raster image, also called a bitmap. It is the lowest cost alternative and produces a very large file size, which is generally non-editable.
- **Level 2 - Raster Image plus Cleanup:** Essentially Level 1 enhanced by cleanup and de-skewing. It removes unwanted entities from the originals and squares the drawing. The file is reduced in size and the image clarity is improved.
- **Level 3-Automatic Vectorization:** Converts the drawing to vector representations of the raster scan.
- **Level 4 - Auto Vectorization plus Text:** Essentially Level 3 enhanced with ASCII text replacing the automatically vectorized text. The text and dimensions are now recognized as text rather than vector data and are editable. Legibility is significantly improved.
- **Level 5 - Enhanced Vectorization:** Level 5 adds intelligence to the drawing by cleaning up the vector quality. Circles, arcs, and other entities are true and precise geometries. Lines are continuous and layered. Objects are clear and orthogonally correct.
- **Level 6 - CAD Perfect:** Level 6 results in a CAD-perfect file. Video tracing or direct CAD redraw are the two processes that produce this level of conversion. All entities are dimensionally and orthogonally correct with fully editable vectors and text. Layers, blocks, symbols, line types, and current NSI standards are incorporated.

1.2 Organization of the Program Managers Implementation Guide (PMIG)

The PMIG consists of four sections and a set of appendices that provide additional information pertinent to the use of the PMIG.

- Part I (Introduction) describes the background, scope, context of the PMIG, the applicable documents, a section to inform the user where to find the relevant acronyms and definitions, Business Context, and DOD conversion environment.

- Part II (Conversion Strategy) This section summarizes the Conversion Strategy, the Management Component of the Conversion Strategy, as well as the Conversion Objectives.

- Part III (Document Conversion Process) provides a technology and acquisition perspective of automated document conversion. This section describes the Document Conversion Process, the PRIME Wizard software that will be used in conjunction with this manual, a description of the Back End Process, and a Worksheets section as well.

- Part IV (Appendices) Lists all the relevant acronyms, definitions, a brief example of a DDS, a description of PRIME, and all relevant worksheets too.

2.0 APPLICABLE DOCUMENTS

2.1 General

The documents listed below are not necessarily all of the documents referenced herein, but are needed to fully understand the information provided in this Guide.

The following specifications, standards, and guides form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the latest issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto.

DEPARTMENT OF DEFENSE STANDARDS

- **MIL PRF 28000 A**
  Digital Representation for Communication of Product Data; IGES Application Subsets & Application Protocols
- **MIL PRF 28001**
  Markup Requirements and Generic Style Specifications for Electronic Printed Output and Exchange of Text
- **MIL M 28002 B**
  Raster Graphics Representations in Binary Format, Requirements for Raster Graphics Representation
- **MIL M 28003 A**
  Digital Representation for Communication of Illustration Data: Computer Graphics Metafile Application Profile
- **AMC-STD-2549A**
  Configuration Management Data Interface

DEPARTMENT OF DEFENSE GUIDES

- **MIL HDBK 61**
  Configuration Management Guidance
- **Data Management Guide**

(Unless otherwise indicated, copies of the above specifications, standards, and guides are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Other Government documents and publications

The following other Government documents and publications form a part of this document to the extent specified herein.

AMC Pamphlet 70-25 "Templates for Streamlining Acquisitions"

Federal Acquisition Regulation (FAR)

(Unless otherwise indicated, copies of the above specifications, standards, and guides are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications

The following document(s) standards and or organizations form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents that are DoD adopted are those listed in the latest issue of the DoDISS, and supplement thereto.

ANSI	**American National Standards Organization**
ASME	**American Society of Mechanical Engineers**
IEEE	**Institute of Electrical and Electronic Engineers**
IPO	**IGES/PDES Organization**
IGES	**International Graphics Exchange Specification**
ISO	**International Standards Organization**
STEP	**Standard for The Exchange of Product data(see below)**

2.4 Order of Precedence

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.5 ISO 10303 (STEP) Overview

STEP, Standard for the Exchange of Product Model Data, provides a representation of product information along with the necessary mechanisms and definitions to enable product data to be exchanged. The exchange is among different computer systems and environments associated with the complete product lifecycle including design, manufacture, utilization, maintenance, and disposal. The information generated about a product during these processes is used for many purposes. This use may involve many computer systems, including some that may be located in different organizations. In order to support such uses, organizations must be able to represent their product information in a common computer-interpretable form that is required to remain complete and consistent when exchanged among different computer systems.

STEP is organized as a series of parts, each published separately. These parts fall into one of the following series: description methods, integrated resources, application protocols, abstract test

suites, implementation methods, and conformance testing. STEP uses a formal specification language, EXPRESS, to specify the product information to be represented. The use of a formal language enables precision and consistency of representation and facilitates development of implementations. STEP uses application protocols (AP's) to specify the representation of product information for one or more applications. It is expected that several hundred Aps may be developed to support the many industrial applications that STEP is expected to serve.

An addition to the STEP standard that certainly will enhance its implementability and acceptance is the constraints that abstract test suites and conformance testing be built into the standard.

The overall objective of STEP is to provide a mechanism that is capable of describing product data throughout the life cycle of the product, independent from any particular system. The nature of this description make it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and archiving. The ultimate goal is an integrated product information database that is accessible and useful to all the resources necessary to support a product over its life cycle.

The following are within the scope of this part of ISO 10303:

? The representation of drawings for the purpose of exchange, especially for mechanical engineering, architectural engineering, and construction application;

? The representation of the real size of a product depicted in a drawing to enable use by applications where true geometric equivalence is required;
(The representation of the shape of the product is required to support not only visual equivalence of exchanged drawings but also where true geometric equivalence is required by the receiving system. Such uses include the calculations of distances or areas and the generation of numerical control tool paths.)

? The representation of a drawing that depicts any phase of the design;

? The representation of individual drawing revisions;

? The representation of the two-dimensional draughting shape model depicting the product shape and the transformations used for the generation of the drawing views;

? The presentation of non-shape product definition data depicted in a drawing by two-dimensional annotations

? The hierarchical structure of drawings, drawing sheets, and views of the draughting shape model;

? The mechanisms for the grouping of the elements depicted on a drawing;

? The administrative data used for the purpose of drawing management

? The administrative data identifying the product versions being documented by the drawing

3.0 DEFINITIONS AND ACRONYMS

3.1 Acronyms

Acronyms used in this Guide are listed in **Appendix A**.

3.2 Definitions

Definitions used in this Guide are listed in **Appendix B**.

4.0 BUSINESS CONTEXT

The Information Management functional area includes records management as a major business process. Records management includes the creation, maintenance, transfer, and destruction of organization records.

Records management defines the policy and provides the structure for managing the life cycle of information contained in records, regardless of medium of storage (i.e., paper, film, magnetic media). Electronic document management defines a subset of information handling concerned with capturing, retrieving, converting, storing, and disseminating digital forms of information. ADC management focuses on the conversion of documents (analog or digital) to the desired digital formats.

The PMIG describes a document conversion strategy that is responsive to mission and business requirements. It also confirms the technical standards to which conversion output products (converted documents) must comply. Technical standards specifying document output formats will evolve. Conformance to the technical standards increases the utility of converted documents to the organization.

The Document Conversion Strategy reiterates DoD automated information system (AIS) life-cycle management (LCM) policy (Automated Document Conversion Master Plan version 1.0 by Office of the Assistant Secretary of Defense ((Command, Control, Communications, and Intelligence/Information Management), and interprets that guidance for the management of all ADC system and service acquisitions within the Department. This ADC guidance focuses on conversion from paper/microform (analog) to digital formats, although the principles and guidelines apply equally to digital-to-digital and other types of document conversion.

5.0 DOD CONVERSION ENVIRONMENT

Motivation to Digitize Documents

Establishing an effective digital document environment is a complex undertaking. Implementation of a digital document environment requires everyone involved to understand the business processes and workflow, to accept the process and technology, and to practice sound records and document management. Management must support the installation of a well-designed technology infrastructure and a financial plan to maintain the new digital environment over the long term. Organizations are vigorously pursuing the benefits of document conversion and imaging technology, based on an industry survey by the Gartner Group. Deciding what documents to convert is crucial to any conversion project. Military mission and business requirements, and a business case that clearly articulates the functional and economic benefits anticipated from conversion, will guide conversion decisions. A recent survey of industry by the Gartner Group identified reasons for adopting imaging systems to support business cases. (The terms "imaging system" and "ADC system" are used synonymously in the PMIG.)

Goals

The following goals should be fulfilled when moving to a digital document environment:

- ? Improve the accessibility of organization records to the DoD work force
- ? Reduce costs to store and preserve organization documents and improve service to document users
- ? Ensure that the output of a conversion effort supports a DoD mission or business process in a cost-effective manner
- ? Avoid unnecessary duplication in the acquisition of ADC hardware and/or software
- ? Avoid repetitive or multiple conversions of the same document
- ? ADC Costs (Short-term and Long-term)

ADC costs have short-term and long-term components. The obvious short-term components include the cost of systems or services to perform document conversion, labor costs to determine the eligibility for conversion and perform quality control, and the cost to provide access mechanisms (e.g., workstations, servers, telecommunications networks). Since document conversion is not a one-time activity, long-term cost components are less obvious. Long-term costs may be generated by the following limitations:

- ? The life of the document is longer than the medium on which it is stored. The document must be recopied to a newer storage medium.
- ? The life of the document is longer than the devices that store and read the medium (e.g., 20-year record stored on an IBM MagCard II device). The document must be read, then restored or reconverted to a new medium before the end of the access device's reparable life.

6.0 CONVERSION STRATEGY

OVERVIEW

The Conversion Strategy consists of two components. The first component focuses on the output product of document conversion, ***the converted document***. The second, ***the management component***, focuses on the management of automated document conversion strategy acquisitions and the high-level requirements that these systems and services must satisfy.

The Conversion Strategy is intended to be flexible. Conversion output products must be accessible to multiple applications, unless the functional need dictates otherwise. This flexibility permits reuse of converted documents and is achieved by converting documents to approved technical standard formats. (i.e.. C4, .TIF, .DWG, etc.)

Document Conversion Strategy may be accomplished by
1) Acquiring specialized but commonly available software and hardware,
2) Acquiring Document Conversion Strategy services from another DoD organization, and
3) Acquiring Document Conversion Strategy services from the marketplace.

The output product of any conversion must conform to the same flexible technical standard format(s) regardless of the acquisition vehicle used.

GOALS

From a technology and acquisition point of view, the Conversion Strategy seeks to:

- ? Maximize the flexibility and utility of converted documents to DoD document users through the requirement to use (e.g., ISO, ANSI, IEEE) technical standards
- ? Ensure that the output of a conversion effort supports a DoD mission or business process in a cost-effective manner
- ? Avoid unnecessary duplication in the acquisition of ADC hardware and/or software.

7.0 MANAGEMENT COMPONENT OF CONVERSION STRATEGY

This section provides additional information on how to conduct a business case review based on the conversion strategy. It begins with an analysis of the requirements and an assessment of the mission or business environment to provide the information needed to support the business case. It then addresses issues involved in developing a cost justification or economic analysis. Methods for assessing technical capability of ADC system architectures are also introduced. Finally, this section introduces the key elements of a decision table to assist program managers in determining if ADC for their specific application will meet their operational need and produce sufficient cost savings or cost avoidance to justify the conversion.

Document conversion is a managed activity. The acquisition of equipment, procurement of services, development of technologies, and development of information systems support document conversion.

Consequently, such acquisitions must:

- ? Be justified by a business case

A document conversion program should be considered:

- ? Only when a military mission or business reason exists for conversion. For collections that include record and non-record material, convert non-record material
- ? (Non-relevant documents) only if the cost of separating it from record material exceeds the cost of conversion.
- ? When document conversion is more cost-effective than document re-creation. Convert organization documents of poor quality only if the cost to convert the document contents through Optical Character Recognition (OCR) is lower than direct re-keying. The cost of scanning and correction of OCR errors may be significantly higher than direct re-keying.
- ? Only when the converted document will be operationally usable in the intended application(s). Conversion programs should focus on documents in which the conversion or end-user system provides adequate image enhancement and editing capabilities to restore any information lost during scanning.
- ? When the converted document may be accessed by multiple applications. Conformance to standard formats will ensure that multiple applications can access valuable business documents directly or indirectly (i.e., through translators or "bridges").
- ? When the long-term cost of maintaining or using the document in its original medium exceeds the long-term cost of maintaining the document in a digital medium.
- ? When the costs of migrating a document over its life include consideration of the long-term stability of the proposed storage medium and the long-term integrity of the storage medium.

An automated document conversion project must be viewed in the context of its mission or business environment. This is accomplished during the development of the business case in support of the requirement.

The requirements (mission need) definition must establish a clear justification for conversion. Cost and performance measures will be developed to evaluate conversion projects.

As a necessary pre-condition to a conversion project, the justification must be approved and meet the following tests:

- ? *Need for information contained in the original documents*
  No conversion should be undertaken unless the information contained in the original document(s) is relevant to the supported mission or business function. For example, conversion of technical documents should be limited to original documents that support currently maintained weapons systems.
- ? *Demonstrated/quantified improvement in the military mission or business process resulting from converting original documents*

This assessment must be made in the context of other considerations, such as the need to protect the original document from permanent loss or the need through document conversion to accelerate an overall business process. For example, the overall cost resulting from a delay in corrective maintenance caused by inadequate access to technical documents may exceed the cost savings realized by not converting technical documents with a low probability of access.

7.1 Information Access and/or Dissemination

The choice of indexing schemes and data elements determines accessibility. The use of a uniform indexing scheme, selected to optimize retrieval requirements of converted documents throughout DoD, is essential to the design of consistent interfaces between the conversion system and any end-user systems. Also essential is the identification of local repositories of converted documents. This is the responsibility of the Program Manager. The adoption of standard data formats further ensures consistency among converted documents.

7.2 Archived Converted Document

The converted document should be stored in an "archival" form to ensure that a converted document, throughout its life, remains available to appropriate applications. Because technology is changing quickly, there is no guarantee that future digital systems may be able to read recordings made on older systems, even if these recordings are still in good condition. In addition, there is no guarantee that *de facto* standards will persist during the life cycle of either a given system or the converted document produced and stored in that system.

However, conversion projects will need to make provisions for the delivery of digital documents on an appropriate medium, that is in the mainstream of technology. The requirement upon future archives must be limited to only those data and media that are certain to be supported in the out-years. Conversion projects must also provide for the safekeeping of conversion software and hardware in sufficient quantity to support document access or future re-conversion to maintain accessibility, until scheduled document disposition.

The requirements for archiving also need to make provisions for back up of the converted documents and disposition of the original documents, in accordance with DoD Records Management policies and procedures.

7.3 Managing Converted Documents

A record consists of information, regardless of medium or structure, detailing the transaction of organization business. ADC is the migration of organization documents from one medium to another. Changing the medium does not change the document's status as a record. Both the original document and the converted document are managed in accordance with approved records management processes and procedures. ADC provides an excellent opportunity to manage organization records using an electronic records management system.

When records are converted to an electronic (digital) medium, that medium will become a part of an electronic records management system. That records system must be capable of:

- ? Printing, presenting, and storing records in their native (original) format
- ? Importing and exporting records between the system storage environment and paper, magnetic disk, optical disk, or other media that requirements justify
- ? Converting system-stored records into standard (e.g., ASCII, TIFF, PDF, or SGML, DWG, CGN, etc.) formats
- ? Storing multimedia information as a single record
- ? Verifying the quality of records transferred
- ? Implementing standardized approaches including cataloging and indexing techniques to facilitate expedient record retrieval and accessibility.

Document Types

Documents include but are not limited to the following physical types:

- ? Forms
- ? Handwritten documents
- ? Type-written documents
- ? Diagrams
- ? Machine-created documents
- ? X-rays
- ? Maps
- ? Engineering drawings
- ? Photographs

DoD uses a wide variety of document types. Several types of documents may be present in a functional document conversion requirement. Three examples follow:

- ? ***Technical and Engineering.*** These documents may include textual materials, geometric drawings, diagrams, photographs, and work cards. Conversion of technical documents may require large-sized equipment for paper-based engineering drawings and technical manual diagrams, microfilm scanners for engineering drawings preserved on aperture cards, and specialized scanners for x-ray films associated with ammunition management and welding operations.
- ? ***Personnel and Finance.*** Most personnel and finance documents consist of text and tabular materials, but may also include photographs and microform materials.
- ? ***Medical.*** These documents include text and tabular materials, charts, x-rays, and other types of recorded medical information.

7.4 Records Management Requirements for Converted Documents as Organization Records

When a converted document becomes the organization record, the converted document shall:

- ? Be categorized and managed in accordance with approved records schedules
- ? Not be maintained beyond the approved disposition
- ? Meet requirements for management and transfer established by the National Archives and Records Administration

Documents will be indexed at the time of conversion to facilitate easy access and appropriate disposition. At least one index based on disposal date must be established. The index aids the identification and disposition of the converted documents in a timely and accurate manner.

7.5 Records Management Requirements for Original Documents as Organization Records

When the original document remains as the organization record, the converted documents shall be:

- ? Managed to facilitate economical use of the information contained in the converted document
- ? Kept only as long as economically necessary
- ? Identified in the organization records schedule as either a working copy or other appropriate label that explicitly indicates the converted document is not the organization record

When the original document remains as the organization record, the original document shall be:

- ? Managed in accordance with approved records schedules
- ? Identified in the organization records schedule as the organization record copy

7.6 Other Issues

The contents of the converted document must remain available regardless of changes in storage technologies, systems, and applications. It is recommended reconverting or copying converted records to remain compatible with new storage technologies and to satisfy approved disposition requirements for temporary and permanent records.

Consequently, the sponsor (program manager) must articulate:

- ? How the converted document will be managed until it has reached the end of the scheduled retention period
- ? How the intended application may impact future reconversion requirements
- ? What migration path, such as the adoption of integrated processes and interactive documentation, will be used to accommodate changes in information systems
- ? Cost Justification

Requirements for cost justification will include operational, financial, and long-term concerns:

- ? ***Operational***. The operational justification must state that the converted document will support the mission or business requirement and that the information contained in the document cannot be obtained from another source in a more cost-effective manner.
- ? ***Financial***. The financial justification must state the financial impact of the conversion process. Additionally, the justification must indicate whether to contract for conversion services, to buy conversion hardware and software, or to use a centralized DoD conversion service.

- ***Long-Term***. The long-term costs associated with managing media for storing electronic documents, hardware to access the media, software to read the media, and migration to newer media due to deterioration of old media must be well understood. Planning should include these costs for the life cycle of the information being managed on electronic media.
- ***Technical Capability.*** The technical capability of a Document Conversion Strategy will be determined by an evaluation of the system's architecture and its conformance to published standards.

7.7 Business Case Decision Table

The decision table below is provided as a guide to assist program managers in determining if the proposed ADC acquisition will:

- Meet operational requirements
- Produce sufficient cost savings or avoidance to justify the conversion

Table I - Business Case Decision Table Requirements Determination

1. Is there a legitimate mission or business need?
2. Will Records Management requirements be satisfied?

Cost Justification

? Can the information contained in the documents be obtained from another source in a cost-effective manner?
? Will automated document conversion reduce costs?
? Has a comparison been made of purchase vs. contracting the automated document conversion service?
? Should centralized DoD conversion services be considered?

Document Candidate Selection

? Are the documents active and do they have sufficient volume?
? Are the documents available to multiple users?
? Do the documents contain valuable and relevant information?
? Do the documents have a relatively long active life remaining?
? Are the input/information processing routines stable?
? Can the original documents be destroyed after conversion?

Technical Capability

? Architecture
? Does the selected architecture support the minimum functionality, ensuring the interoperability of the converted documents?
? Standards
? Are relevant standards identified to ensure interoperability of the converted documents?

Once the decision is made to proceed with automated document conversion, the following should be used as conversion strategy guidance:

? First Stage Conversion
    1. Use the Business Case Decision Table Requirements determination standards from Table I or provide a business case for use of proprietary standards and a migration strategy to open systems.
    2. Evaluate standards to ensure they meet the interoperability requirements and use non-proprietary formats.

If first-stage document conversion meets the end user's functional/mission requirements, proceed with LCM documentation. If the conversion does not meet requirements, then move to second stage conversion.

? Second Stage Conversion
    3. Tailor document conversion to meet end-user requirements.
    4. Evaluate standards to meet interoperability requirements and use non-proprietary formats.

If interoperability cannot be achieved with second stage conversion, evaluate the cost of maintaining an interoperable baseline copy after first stage conversion.

8.0 CONVERSION OBJECTIVES

8.1 Data Conversion Strategy Concept

Table II, and Table III, illustrate project objectives which Program Managers must meet and provide typical metrics to measure success. A review of the Objectives will help Program Managers understand Document Conversion Strategy goals and will provide metrics to assure a comprehensive Document Conversion Strategy.

TABLE II. Document Conversion Strategy Objectives

I. Program Managers

Assure that government processes are in place, cost effectively sustain support requirements and equipment needs, achieve operational stability, evaluate staffing requirements, and measure/evaluate contractor's progress. It is important that specific procedures are defined, audit reporting and records procedures are defined, business rules are verified, and to assure that contractor meets approved engineering related document identification/tracking standards.

The Government must also address the following items:

? Conduct operational testing
? Validate the production process i.e.: engineering related document conversion process
? Conduct initial low-rate production tests
? Certify contractor's conversion and documentation processes
? Assure that data loss meets parameters specified in Phase I
? Assign nomenclature as is appropriate
? Recommend Document Conversion Strategy conversion format to be used
? Define product handling procedures for original and converted documents
? Determine storage medium for converted engineering related data
? Determine final disposition of original engineering documents

II. Both Program Managers and Contractor's

Both parties must have access to engineering related documents/data available on time, assure that the process of product identifying/tracking data is accurate and consistent, provide for converted document delivery and disposition, provide for and track changes and audit items.

? Audit planning and preparation need to be defined. Audits will review performance requirements, test plans and results, physical inspection of final product for accuracy, consistency, and cataloging/identification completion
? It is important to record and implement 'lessons learned' into the conversion process, and to assure that performance/cost parameters are met
? Engineering related conversion format capabilities, cost per unit, quality of product and equipment needs (HW and SW) will be determined and agreed upon
? Provide for converted engineering related document data to be available via on-line data services, Web based technology, secure networks and other appropriate means

III. Contractor's

The documentation and validation of the Document Conversion Strategy is of primary importance. The contractor must report and record testing and implementation status, coordinate hardware and software capabilities and needs, assure that engineering documents conform to standards for identification/tracking, and provide training to appropriate personnel.

TABLE III. Metric Assessment Objectives

I. Program Managers

? Utilizing the Document Conversion Strategy performance specification, conversion software is chosen that produces the desired file format. The software applications meet the required criteria
? Production testing will provide quantifiable elements of cost, accuracy, speed, cleanup, storage, and overall timing
? Tests will be conducted on any engineering related documents to include but not limited to: engineering, mechanical, electrical, civil, electronic, and architectural

II. Program Managers and Contractor's

? Identification/tracking data will be monitored to assure accuracy and consistency from conversion vendors
? Hardware and software test are conducted in a controlled manner to facilitate accurate decisions as to the format to be used
? Test and evaluate the ability of each selected format to be used with on-line data services, Web based technology, and secure networks

III. Contractor's

? Measure conformance of format selected for conversion process against goals and standards
? Report progress, problems, concerns, and schedule changes to controlling authority

8.2 Concept of Operations

A documented, well-defined Document Conversion Strategy project Concept of Operations (CONOPS) is integral to program planning and management. The Document Conversion Strategy CONOPS for a specific project outlines government requirements, including the ability to receive and utilize various formats of data. The converted data may be provided by contractors, or interchanged among government activities involved in document conversion. The Document Conversion Strategy CONOPS for a specific project provides the strategy for the acquisition and use of data throughout a program's life cycle. Comprehensive Document Conversion Strategy CONOPS development for a specific project provides the framework for government and contractor participation in the Document Conversion Strategy project process development, documentation, and implementation.

The Document Conversion Strategy provides the framework for implementation of a partnership between government and its contractor. For the foreseeable future, engineering document conversion infrastructure must accommodate both existing and future standard processes. An effective Document Conversion Strategy should address:

? Document users, types of documents, frequency of use and timeliness of document access or delivery to each user.
? Government hardware and software systems to use or in development to manage and use converted document data.

- ? CAD/CAM exchange requirements including format, media, and applicable standards and existing telecommunications/network capabilities.
- ? Concurrent access by multiple functional users.
- ? Rights access authorizations and restrictions.
- ? Document management responsibilities.
- ? Flow of converted document/data among government site.
- ? Identification of converted documents and metadata requirements.
- ? Methods to be used for the exchange and final disposition of document/data

Table IV illustrates the means by which Program Mangers typically progress through the conversion process.

TABLE IV. Document Conversion Process

1. Identify Document types	**2. Identify WHO will use the Document**
? Drawings o Mechanical o Electrical o Civil o Architectural o Electronic o GIS Mapping ? Technical Manuals ? Graphics/Illustrations/Foldouts	? Acquisition ? Engineering ? Operations ? Maintenance ? Logistics ? Production
3. Determine WHAT the users will do with each document. (type)	**4. Identify the users Infrastructure**
? View Only ? Comment/Annotate ? Edit/Extract/Transform ? Archive ? Secondary distribution ? Analysis ? Production ? Test	As is expected to be available after Conversion ? Hardware ? Software ? Networks ? Web enabled ? Trained Personnel

TABLE V. ABC's For EACH Type of Document

A. Identify Document Existing format ? Composed Documents: ? Paper ? Mylar ? Aperture Card ? Microfiche ? Size of Page ? Drawing, Card, binder, book ? Select Target data files: ? 2-D/ 3-D ? Raster ? Vector ? Text ? Document ? Image File ? GIS Mapping	**B. Determine Formats for interchange of Converted Document Data** ? PDF ? IGES ? STEP ? DXF ? ASCII ? HTML ? XML ? SGML
C. Determine Required government and industry Data Standards ? Document Image Standards ? Engineering Drawing Standards ? Text Standards ? Graphics Standards ? Audio File	**D. Determine the Type of Media for Delivery of Converted Data** ? Optical Disk ? Re-Writable CD-ROM ? Floppy Disk ? Telecommunication Ex: Email, Secure Network, Encrypted ? WEB enabled ? Contract/contractor specific ? Magnetic Tape (9 track)

NOTE:
The specification addresses the conversion of composed (hard copy) and previously converted raster formatted documents. Vector-to vector conversion and Composed –to-Raster conversion is outside the scope of the specification. Reference to graphics and audio formats are for information purposes only.

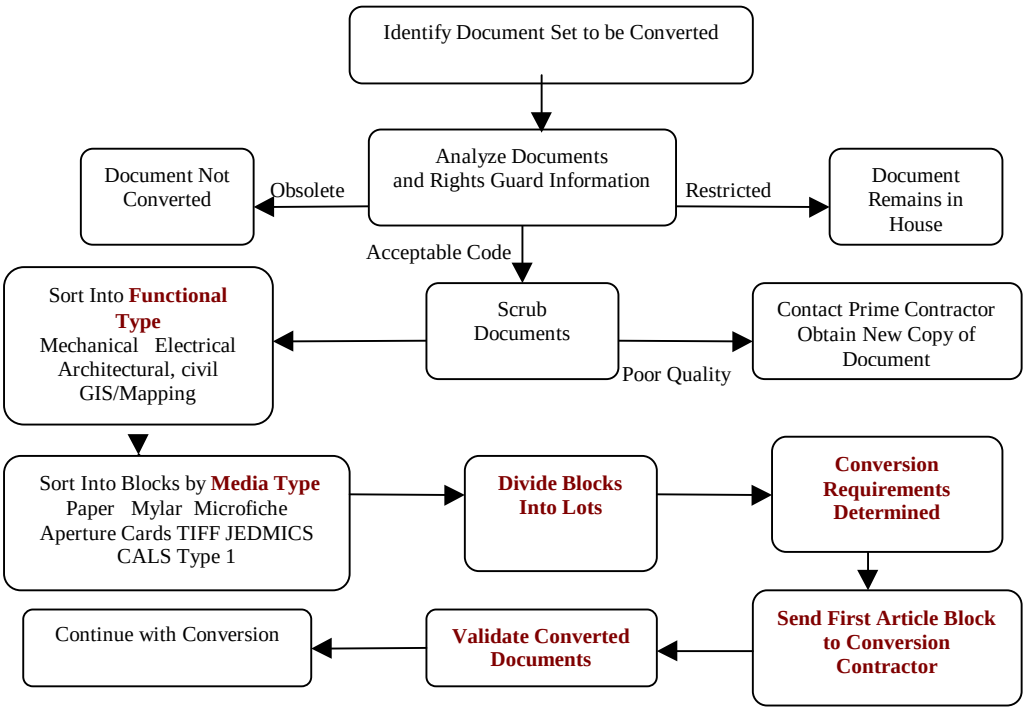
Creating an effective Document Conversion Strategy by "walking" through the steps listed in Table IV is facilitated with a User Worksheet (appendix F). The User Worksheet allows Program Managers to systematically identify existing documentation and provides the framework necessary to record required information for each conversion project. Located in Appendix F, the Document Conversion Strategy User Worksheet is provided for photocopy and its use is recommended.

Program Managers must provide effective management throughout the conversion process. Initially, Program Managers identify the program-selected data set. The data set is scrubbed, and image quality evaluated. Documents that cannot be read may be returned to the prime contractor to provide documents of greater quality.

Some elements to consider in any CONOPS include the following. The functional type, number, and size of the documents requiring conversion are determined. The data set is separated into blocks according to functional type (i.e. mechanical, electrical, architectural, civil, GIS). Every block of functional type data is further separated into blocks according to existing format. (i.e. paper, Mylar, aperture cards, microfiche, TIFF, CALS Type 1, JEDMICS). For example, within a data set of mechanical drawings, there may be paper drawings and there may also be Mylar drawings. In this example the Program Manager would separate this data set into two blocks, one-block mechanical paper drawings and the other block mechanical Mylar drawings. Each document block is a separate conversion project, requiring project-specific performance specifications. Each block is then divided into lots, which are smaller "packages" of document blocks.

After dividing the document block into lots, the conversion requirements for the project are prescribed. The output format is determined, followed by selection of the conversion vendor. The conversion begins as First Article is performed. The lots are validated as conversion is completed. Any required changes must occur, and then are validated. The documents go through the process and finally the converted documents are stored.

Document Conversion/Validation Process Flowchart
Figure I



Detailed analysis of the above procedures is beyond the scope of this specification. This guide specifically assists Program Managers to determine project-specific conversion requirements.

9.0 DOCUMENT CONVERSION PROCESS

Before a Program Manager procures conversion service, the existing documents must be analyzed to determine number, type, use, existing format, output format, delivery media, and other information. This Guide is designed to help Program Managers document the results of these determinations. The purpose of these activities is to ultimately produce a Performance Specification to be given to a contractor to procure conversion service. This Performance Specification will contain the information the contractor will need to successfully complete the conversion. It will specify input and output formats, input and output medias, delivery methods, metadata requirements and other specific requirements.

Program Managers can generate a project-specific Document Conversion Strategy Performance Specification in two ways. The Program Manager may use the **Project Related Information Management and Execution (PRIME)**. PRIME is an interactive software tool specifically designed to support the PMIG. This performance specification can be sent to a contractor in its basic form or can be edited using Microsoft Word. Instructions for the use of PRIME are located in **Appendix E**. Program Managers may elect not to use PRIME, and may create a

performance specification manually using the Word templates and worksheets. Both options will provide output, a project-specific Performance Specification, including a recommended conversion format.

The PMIG CD-ROM contains the following files:

- Auto Install File
- PRIME Wizard
  - PMIG
  - Document Conversion Strategy Performance Specification (Template)
  - Associated Applications
    - Examples of CDEX Files
    - Examples of Document Conversion Strategy Metadata Files
    - Examples of Product Data Metadata Files
  - Detailed Definition Specification Packages
    - Mechanical 2D CAD Capable
    - Mechanical 2D CAD Perfect
    - Mechanical 3D CAD Perfect
    - Electrical 2D CAD Capable
    - Electrical 2D CAD Perfect
    - Electrical 3D CAD Perfect
    - Electrical Schematic
    - Architectural 2D CAD Capable
    - Architectural 2D CAD Perfect
    - Architectural 3D CAD Perfect
    - Civil 2D CAD Capable
    - Civil 2D CAD Perfect
    - Civil 3D CAD Perfect
    - UNI-Discipline (Raster only)
    - GIS/Mapping
- Associated Links
  - **Web Addresses**
  - Location of Associated References
- Tools and Capabilities
  - Metadata Tools

Figure 2. Document Conversion Process is a flowchart detailing the items to be determined before conversion services can be successfully procured. **Figure 1. Document Conversion/Validation Processes** demonstrates the steps required in preparing First Article Blocks and subsequent lots. It outlines the validation process necessary to determine correct conversion. **Figure 6. Back End Process** illustrates the steps required to release converted documents for general use. These flowcharts correspond to and are linked to specific paragraphs within the text.

9.1 Determining Conversion Requirements

Use **Figure 2. Document Conversion Process** flowchart and the paragraphs in the following sections to determine documents type, media type, delivery method, output format, final disposition of originals, and other information.

The **User Worksheet (Appendix F)** can be used to compile the necessary information. The following paragraphs correspond to lines on the User Worksheet and to boxes on the flowchart in **Figure 2** .

9.2 Identify Document Type

Determine the documents to be converted and sort them into blocks of like functional type (i.e. mechanical, electrical, AEC, GIS). Next, sort them according to size. Place an 'X' in the one box on **Step/Line No. 2** of the Document Conversion Strategy User Worksheet, beside the functional type of documents.

Step/line No.:	Question:	X	Drawing Type:
2. **PRIME**	Type of Documents?		Mechanical
			Electrical
			Architectural/Civil
			GIS/Mapping

Note: Documents of different functional type are placed in separate blocks. Each block requires a separate Performance Specification. A separate User Worksheet will be required for each document type. Each block of documents will contain only one functional type of drawing.

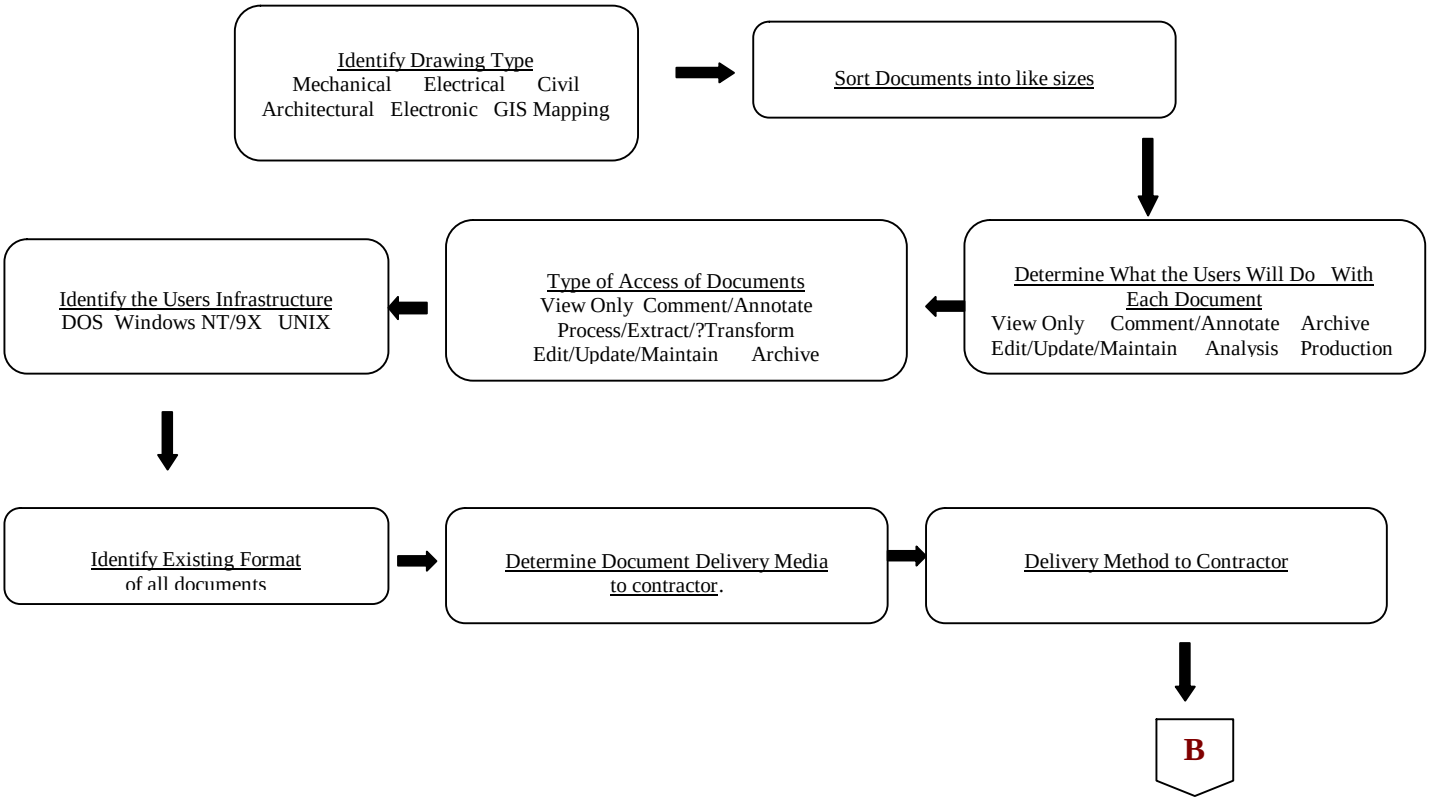
9.3 Determine Number by Size

After separating the documents by functional type, sort the documents in the block into like sizes and place the number of document sheets, for each size, on **Step/Line No. 4** of the Document Conversion Strategy User Worksheet.

Step/Line No:	Question:	Number of Sheets:	Size:
3.	Number of Documents?		A
PRIME			B
			C
			D
			E
			F
			G
			H
			J
			K

Drawing Sheet Size (and Format) are defined in **ASME** Y14.1

Document Conversion Process



Continued on page 34

Figure 2. Document Conversion Process

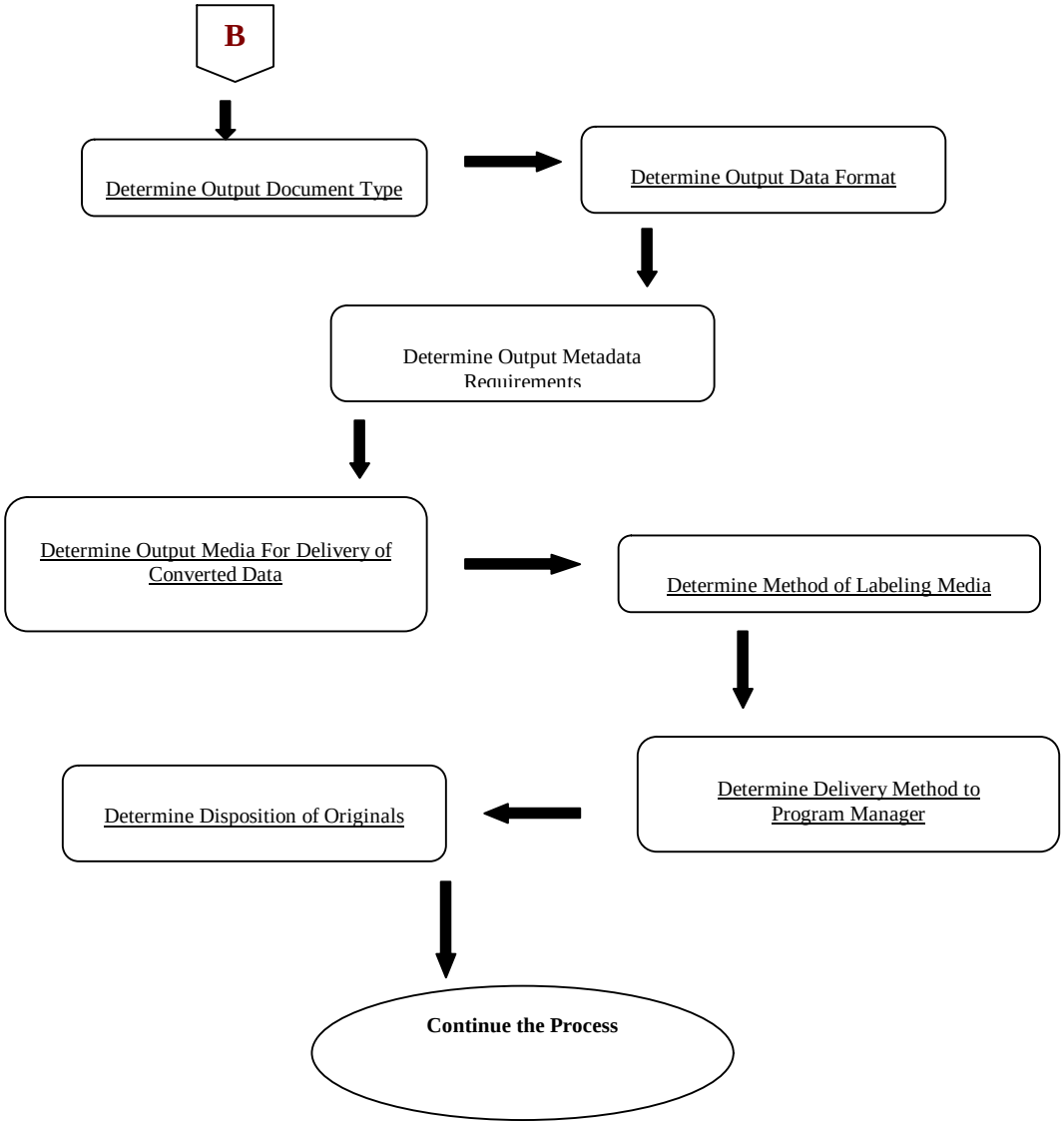


Figure 3 Document Conversion Process (Continued)

9.4 Delivery Schedule

Effective project management requires timely document conversion. A Deliverable Schedule is recommended to facilitate communication between Program Managers and contractors. **Appendix I** contains a **Deliverables Schedule Form**, which allows for documentation of predefined delivery dates agreed upon by Program Managers and contractors.

9.5 First Article Block

Once sorted, the Program Manager selects a representative subset of each drawing size, which is the initial block sent to the contractor. This initial block is considered the First Article Block and is sent to the contractor with the **Task Order**, the **Performance Specification**, and the **Detailed Definition Package** pertaining to the conversion project.

Note: Program Manager may elect to forego including a Detailed Definition Package, if the contractor has established a level of trust in the type of document conversion procured. However, since the Detailed Definition Package provides the means for verification throughout the project, providing the contractor with this information is recommended.

Determine the number of documents to be included in your First Article Block. The First Article Block should not be less than 10 documents nor more than 50 documents. It should be based on the complexity of the project. For more complex conversions, a higher number of documents are recommended for First Article conversion. The Program Manager should determine an appropriate number of successfully converted documents required to ensure the contractor is meeting the requirements detailed in the Performance Specification.

First Article information is entered on **line 6.1.3.1** of the Document Conversion Strategy User Worksheet. Determine the length of time, in days, that the contractor will have to complete the conversion of the First Article documents and enter the information on **line 6.1.3.2** of the Document Conversion Strategy User Worksheet.

9.6 Contractor Acknowledgement of Block

After the First Article Block is sent to the contractor, acknowledgement of block receipt is required to the Program Manager through electronic mail. The contractor should inspect all drawings provided for conversion to ensure sheet legibility and number of drawing sheets provided. The contractor should note any discrepancies on an exemption report, which is sent to the Program Manager for resolution.

9.7 First Article Block Return

Post conversion, the documents are returned to the Program Manager in the predefined format, on the predefined media, and within the specified time. The converted documents are returned with the completed **Task Order** information. If the First Article conversion is successful, and the Program Manager has adequate funding, subsequent lots are released to the vendor. The Program Manager can determine the cost of the conversion project by multiplying the number of sheets to be converted by the cost per sheet.

Note: The cost per sheet is supplied by the contractor on the Task Order.

9.8 Validation

Validation is the means by which a contractor proves his ability to produce a conversion output that conforms to the requirements defined in the Performance Specification's Detailed Definition Package. Program Managers establish specific quality requirements that are maintained through Audit and Validation.

Requirements may include responsibility for inspection, establishment of quality or inspection program requirements, warranties, instructions for nonconforming items, and contractor liability for nonconformance. This section does not include instructions for nonconforming items or contractor liability for non-conformance; see FARS 46.407

Validation audits are performed during production and are completed after final product delivery. Program Managers assure the accuracy of the following items, which are critical to validate the end product of engineering related document conversion: **Format**, **Dimensionality**, **Geometric Representation**, **Metadata**, and **Associated Data**. TABLE VI, below, provides specific questions Program Managers may ask to ensure that validation criteria has been met.

TABLE VI. Validation Items

Validation criteria	Metric
Format	Are the converted drawing/document files in the digital file format specified?
Dimensionality	Are the requirements set forth in Detailed Definition Package met for each and every item?
Geometric Representation	Is the representation exactly as specified in Detailed Definition Package?
Metadata (Required)	Are the Required JEDMICS/CDEX, PMIG, and Product Data (PD) Data Elements included and are they accurately listed?
Metadata (Optional)	Are the Data Elements added from the Optional category (CDEX, PMIG, and Product Data) included and listed accurately?
Media	Is the specified Media used to deliver converted drawing/document files?

Program Managers use at least one of four appropriate validation methods for the type of documents being converted. Method definition is located in **Appendix C. Demonstration**, **Inspection**, **Analysis** and/or **Test** are used to determine that the conversion process meets contractual requirements. **Appendix L** contains the **Document Conversion Strategy Validation Tables** which detail the validation type recommended for the specific requirements of each functional type of drawing. Results of the validation method provide metrics to define an acceptable product and to verify contractor compliance with conversion requirements.

9.9 Validation of First Article Blocks

If validation of the First Article Block shows a successful conversion, the Program Manager sends a second lot containing a larger number of documents to the vendor. The procedure is repeated.

Once again, the contractor must verify lot arrival and conform to the specifications on the **Document Conversion Strategy Shipping Form**. A sample Document Conversion Strategy Shipping Form is located in **Appendix H**

9.10 First Article Conversion Unsuccessful

If the First Article Block failure rate is more than 1%, a new First Article Block should be given to the contractor for conversion. The contractor should be placed on Notice of Failure to meet contractual requirements and informed that if the second attempt proves unsuccessful, a different contractor will be selected. If the First Article conversion is successful, the contractor will be subject to larger document lots for conversion.

9.11 Select New Contractor

If the contractor is unable to achieve First Article acceptance on the second lot submitted, alternative contractors should be identified. The process to select a contractor must begin again.

9.12 Validation of Second and Subsequent Blocks

Until a level of confidence with the contractor has been established, a higher number of documents within a lot should be verified. More of the converted First Article Block should be verified than in subsequent lots, when a level of confidence has been established.

As each lot is returned to the Program Manager, the contractor will be notified via e-mail of any errors found. Once the contractor has made the corrections, he will add the ERR (Engineering Release Record) number and his initials to each converted drawing sheet in the lot. **Appendix N** contains a copy of the Engineering Release Form.

10.0 PRIME WIZARD

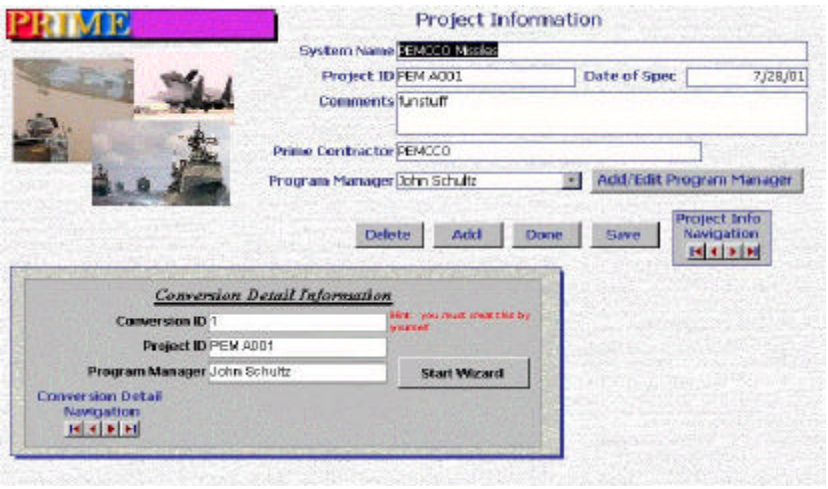
Instructions for Project Related Information Management and Execution

"PRIME"

10.1 Using the Project Related Information Management and Execution (PRIME)

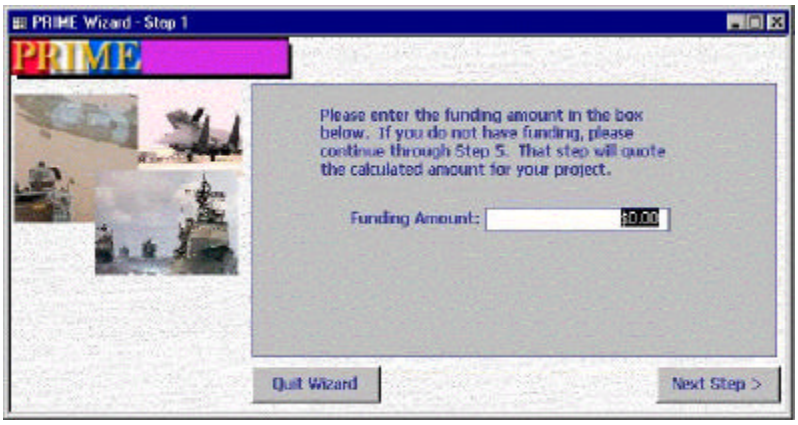
PRIME asks a series of project-specific questions pertaining to your particular project. As information is entered and options selected, PRIME collects and compiles this information to make format determinations and to complete a **Task Order (Appendix M**), if one is needed, to use in the procurement of conversion services. The information will also be used to prepare a Performance Specification. This Word file can be edited, printed and sent to a contractor. **Figure 4** is a flowchart of PRIME's processes.

The opening slide asks for the various ID fields. This includes Project ID, date of Specification, Program Manager etc. A graphic of the opening slide is shown below:



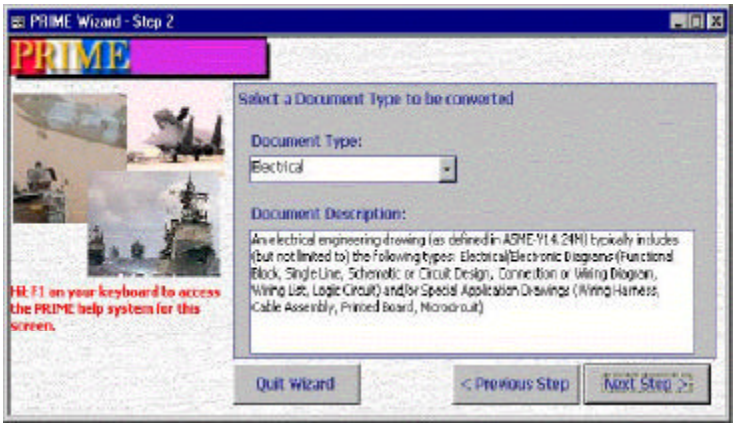
After completing the information on the opening slide of the PRIME software you will click on the button for 'next step'. This will lead you to the next prompt which states:

10.1 "Enter Amount of funding." _____

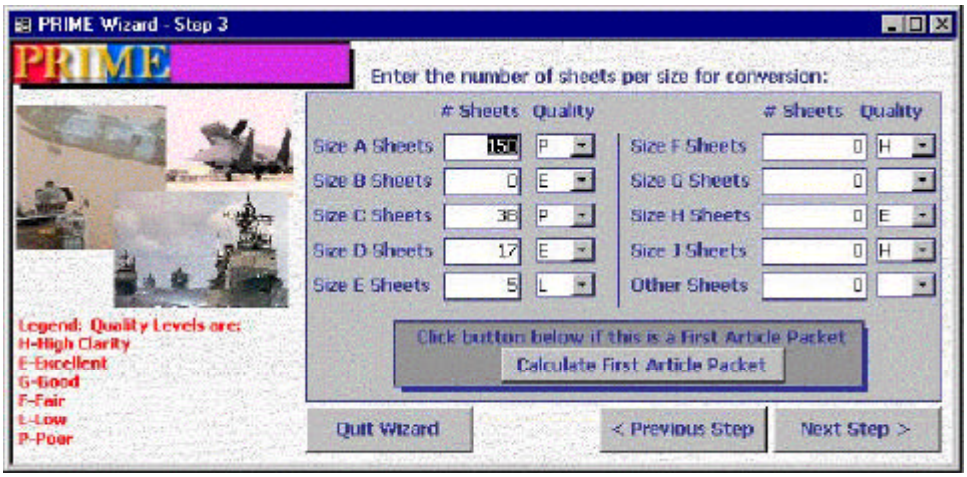


10.2 "Please Select Document Type to be converted."

- ? Mechanical
- ? Electrical
- ? Architectural
- ? Civil
- ? GIS/Mapping



10.3 "Enter the number of sheets per size for conversion"



On this same slide there will be a button that states:

10.4 “Click button below if this is a First Article Packet” and will then proceed to calculate the necessary information to compile the packet.

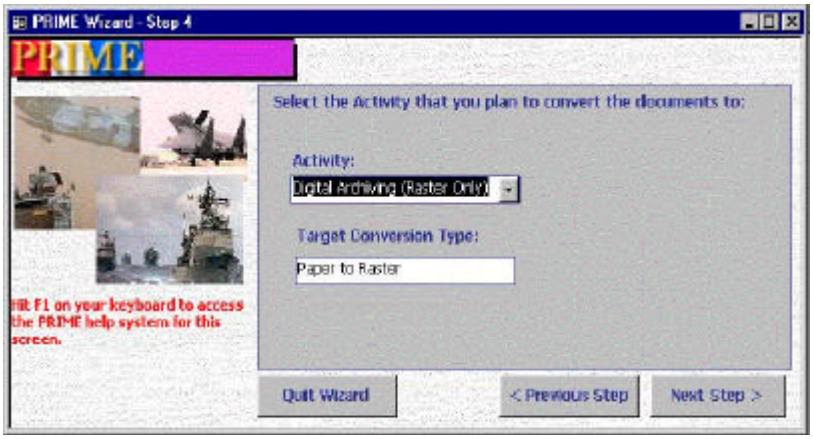
The number of documents required in a First Article conversion should reflect the complexity of the conversion. The First Article Block is a **Task Order**.

Calculate First Article numbers based on drawing set and minimum and maximum requirements. The First Article Block should not contain less than ten nor more than fifty documents. Multiply the total number of documents by 1%. If the results are less than ten, send ten documents. If the results are more than fifty, send fifty documents. If you only have five documents, send all five.

PRIME will calculate the total cost for the number of documents you want to convert and will compare this amount with the amount of allocated funds entered in question 10.1 If there is sufficient funding, you will proceed to the next question. If you have insufficient funding, you will be asked if you wish to re-specify or continue. If you choose to re-specify, you will be returned to question 10.3, where you can decide to convert a smaller number of documents at this time. If you choose to continue, you will proceed to the next question, knowing you will need to obtain additional funding to convert the number of documents you have specified in question 10.3.

Note: PRIME calculates a per sheet cost utilizing data conversion industry standard costs and pricing from GSA schedules as of Oct. 2001.

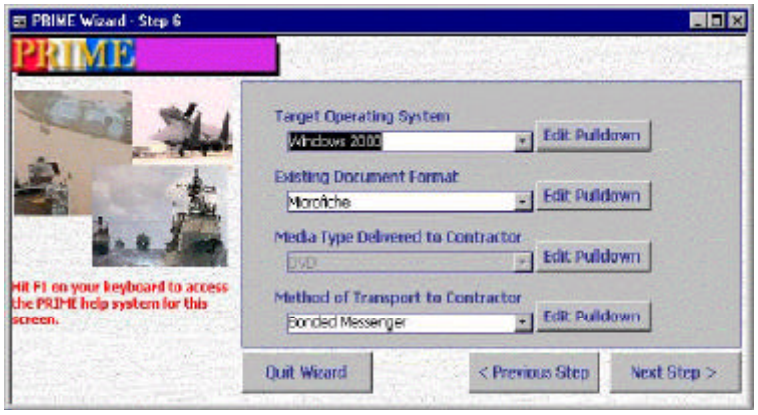
10.5"Select the Activity that you plan to convert the documents to"



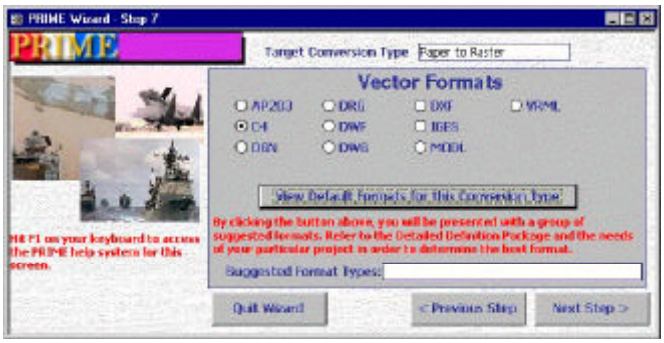
You may select the activity by accessing the pull down menu. Once you have selected the activity PRIME will automatically enter Target conversion Type for you. However, you may select this option as well by accessing the pull down menu for it too.

10.6 " The financial Report"

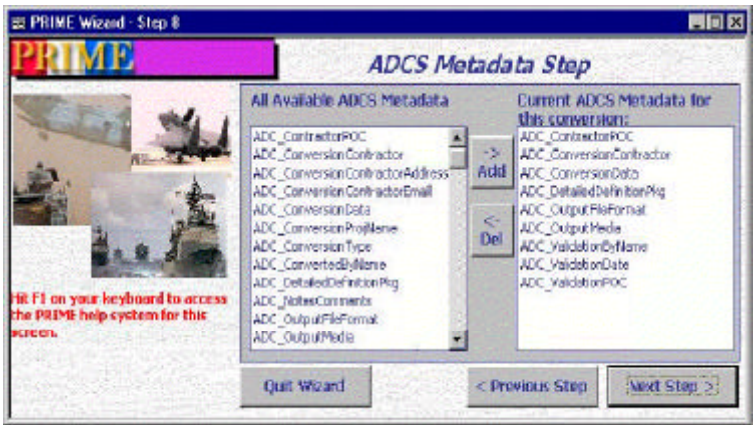
10.7 "What is the target system, existing document format, media type delivered to contractor, and method of transport to contractor."



10.8 "Vector Formats



10.9 "Metadata Steps"



There is often additional information that must accompany a drawing sheet. This information can be in the form of unique instruction, contractor information, or other document-dependent details. This accompanying identifying information is called metadata.

There are three types of metadata; **JEDMICS/CDEX**, **ADCS**, and **Product Data**. Some elements in each type of metadata are required and some elements are optional. PRIME displays all three in a 'tabbed' format. Each element has a selection box. Required metadata elements are pre selected by PRIME. These cannot be de-selected.

Program Managers may select optional elements in addition to the required elements for each type of metadata by clicking in the box adjacent to the element. If additional optional elements are unnecessary, you may accept those selected by PRIME only.

10.10 "Media to return converted documents on, Label type for first article packet, method of return for converted documents, original documents disposal method"

This allows the Program Manager to determine on what media the converted documents will reside. For example, if you prefer to store the converted documents on CD-ROM, this allows you to specify that information. The Program Manager can also specify how the media is to be labeled. For example, if a CD-ROM is preferred, it cannot have a paper label.

10.11 Enter in the Lot size, Minimum, Maximum number of drawings to be Drawn on a weekly basis.

PRIME will calculate the number of lots based on the total number of documents and information entered from previous questions.

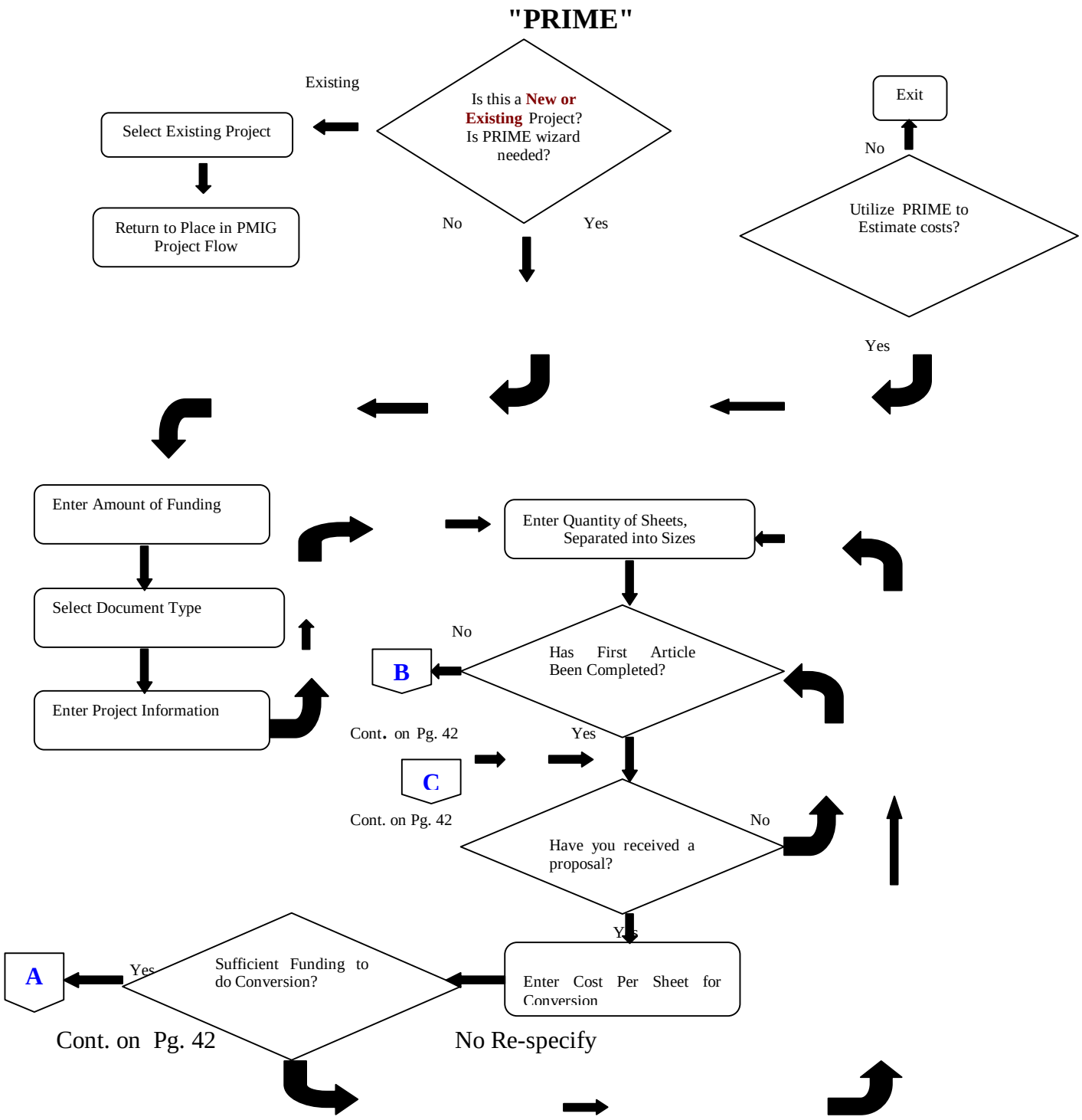


Figure 4 – Project Related Information Management and Execution (PRIME)

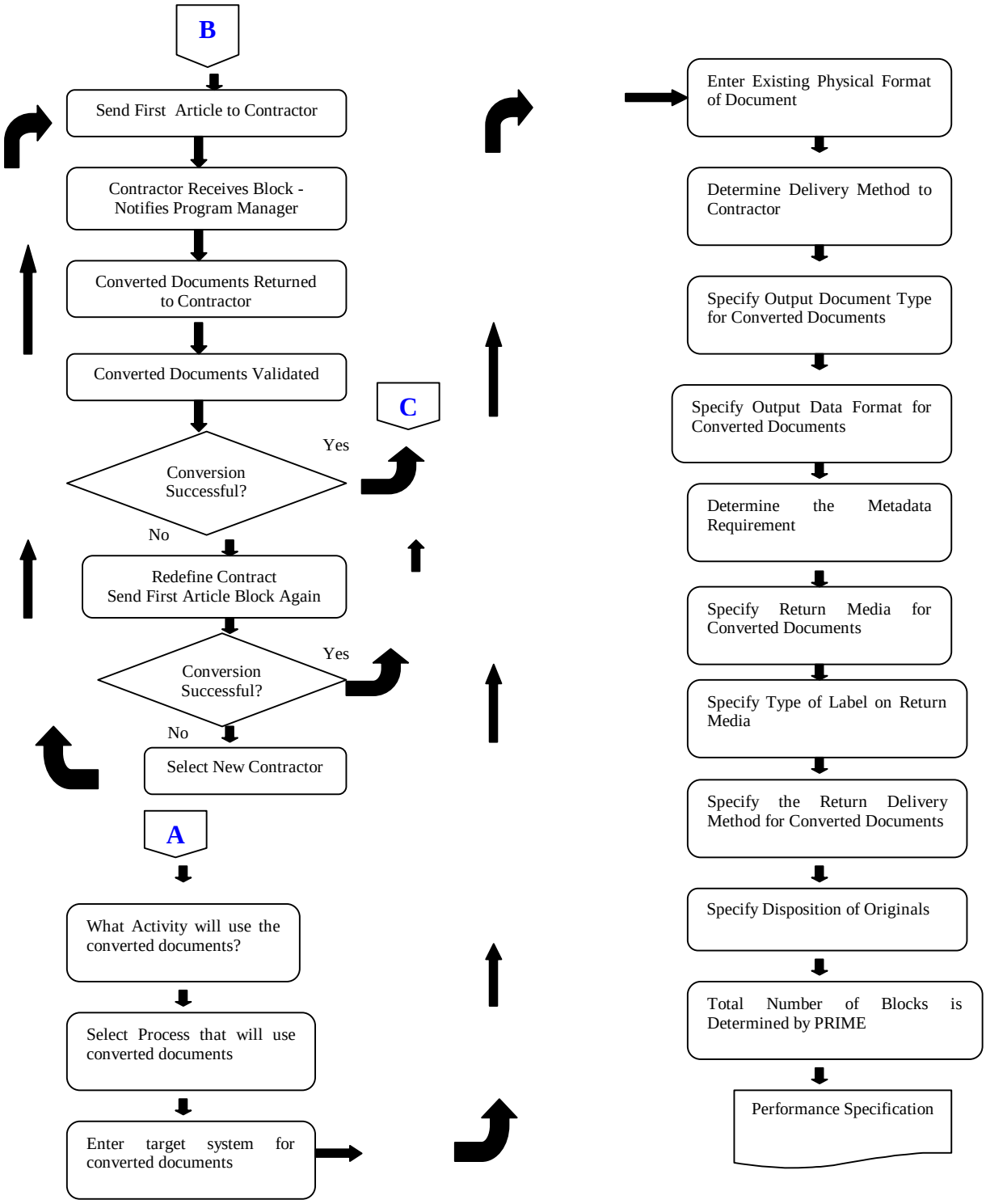


Figure 5 – Project Related Information Management and Execution (PRIME) (Continued)

11.0 Back End Process

Following successful conversion, the product is sent to the program office for validation. After the product is validated, it is sent to the checker and approver, who place their signatures in the Title Block of the product. The product then goes through the DoD Engineering Change Control Process. Once the Configuration Board Control gives their approval, the product becomes eligible for release. Figure 6 demonstrates the Back End Process.

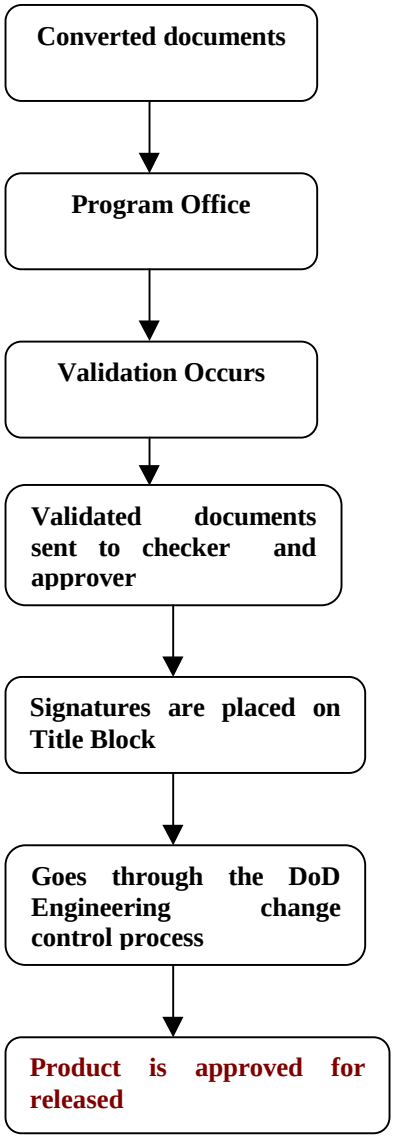


Figure 6. Back End Process

12.0 Worksheets

Appendices J and L contain several forms and information to assist in validation. One form is a Sample First Article Signoff Sheet. Through use of this form Program Managers are assured that First Article was performed and allows for detailed explanation of success/failure. The second section, Validation Tables for Functional Areas, details the best means to verify specific conversion requirements. The functional areas of Mechanical, Electrical, Architectural, and Mapping separate validation requirements. Specific validation methods are provided for each specific conversion requirement. Validation Table use will provide Program Managers with a powerful tool for validating conversion format. The third form in Appendix K for Validation is a simple Validation Signoff Sheet. Similar to the First Article Signoff Sheet, use of this form assures Program Managers that validation was performed and allows for detailed explanation of success/failure. If used in hard copy, both the First Article and Validation Signoff sheet can be placed in a program book for quick reference and proof that First Article and Validation took place.

13.0 APPENDIX A ACRONYMS

ADCS	Automated Document Conversion Strategy
ADC	Automated Document Strategy
ADRG	ARC Digitized Raster Graphics
AMC	Army Materiel Command
AMSAA	Army Materiel Systems Analysis Activity
AMSDL	Acquisition Management Systems and Data Requirements Control List
ANSI	American National Standards Institute
AP	Application Protocol
AS	Audit Strategy
ASCII	American Standard Code for Information Interchange
ASME	American Society of Mechanical Engineers
BMP	Bitmap (graphic file format)
BPR	Business Process Requirements
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CAE	Computer Aided Engineering
CAGE	Commercial and Government Entity
CALS	Computer-aided Acquisition and Life-Cycle Support
CALIP	CALS Implementation Plan
CAM	Computer-Aided Manufacturing
CCITT	International Telegraph and Telephone Consultative Committee
CDEX	Compact Disc Data Exchange
CD ROM	Compact Disc – Read Only Memory
CDRL	Contract Data Requirement List
CFF	Cartographic Feature File Format
CGM	Computer Graphics Metafile
CMM	Coordinate Measuring Machine
CONOPS	Concept of Operations
COTS	Commercial Off The Shelf
COVERAGE	Arc/Info “Coverage” format
DED	Data Element Definition
DLA	Defense Logistics Agency
DLG-STD	USGS Digital Line Graph STANDARD format
DLG3-OPT	USGS Digital Line Graph OPTIONAL format
DMDF	Digital Map Data Record Format
DoD	Department of Defense
DID	Data Item Description
DoDISS	Department of Defense Index of Specifications and Standards
DTED	Digital Terrain Elevation Data
DXF	AutoCAD Drawing eXchange Format
EIA	Electronic Industries Alliance

EDMS	Engineering Data Management Systems
EXPORT	Arc/Info “Export” format
FAR	Federal Acquisition Regulation
FCG	Functional Coordinating Group
FIP	Federal Information Processing
GCO	Government Concept of Operations
GENERATE	Arc/Info “Generate” format
GIF	Graphics Interchange Format
GIS	Geographic Information Systems
HQ	Headquarters
HTML	Hypertext Markup Language
HW	Hardware
IDEF	Integrated Definition Language
IEEE	Institute of Electrical and Electronic Engineers
IGDS	Intergraph Graphics Design System
IGES	Initial Graphics Exchange Specification
IPO	IGES/PDES Organization
IPR	Initial Program Review
ISO	International Standards Organization
JEDMICS	Joint Engineering Data Management Information and Control System
JPEG	Joint Photographic Experts Group
MIL-STD	Military Standard
MOSS	Map Overlay and Statistical System format
MSCs	Major Subordinate Commands
NARA	National Archives and Records Administration
PDES	Product Data Exchange using STEP
PDF	Portable Document File
PEOs	Program Executive Officers
PM	Program Manager
PMIG	Program Managers Implementation Guide
RFP	Request for Proposal
RFQ	Request for Quote
SDTS	Spatial Data Transfer Standard
SGML	Standard Generalized Markup Language
SOW	Statement of Work
STEP	Standard for the Exchange of Product Model Data (ISO 10303)
SW	Software
TBD	To Be Determined
TIFF	Tagged Information File Format
TM	Technical Manual
WORM	Write Once Read Many
XML	Extensible Markup Language

14.0 APPENDIX B DEFINITIONS

Acquisition	The acquiring by contract, with appropriated funds, of supplies or services by and for the use of the Government that are already in existence or must be created, developed, demonstrated, and evaluated.
AMC-STD-2549A	This standard prescribes data elements, data element definitions, and data element relationships. The data relationships are based on business rules derived from the CM principles contained in ANSI/EIA649
Annotate	Textual information on a drawing. Any information that is neither geometry nor dimensions.
ANSI	American National Standards Organization, which promotes the use of U.S. standards internally, advocates U.S. policy and technical positions in international and regional standards organizations, and encourages the adoption of international standards as national standards where these meet the needs of the user community.
Aperture Card	A standard that is encoded IBM-style punch card that acts as a transport for a 35mm transparency. Typically, aperture cards are used to store blueprints and engineering drawings.
Archive	A system administration operation that compresses one or more separate files into a single file on a removable magnetic or optical media for permanent long-term storage and data protection. The archival file also contains information to allow the compressed files to be extracted by a restoration program.
ASME	American Society of Mechanical Engineers, an organization founded in 1880 and grown into an international society. ASME has thirty-eight technical divisions that offer invaluable resources to the engineering professional.
Assembly Drawings	A number of drawings or subassemblies, or a combination thereof, that are joined together to perform a specific function and subject to disassembly without degradation of any of the parts.
Attribute	A property or characteristic that is common to some or all of the instances of an entity.
Attributes Revision	An identified and tracked change to a product structure element, document or document representation. The status of a particular revision may be released or working.
Audit	An examination of work product/process or a set of work product/processes to assess compliance with contractual agreements, specifications, standards or other criteria.
Bilateral Tolerance	Bilateral tolerance specifies the allowable deviation of a drawing from its defined shape and dimension.
Bill of Materials	Identification listing of production with the next higher level product linkage.
Budget	The funds programmed for document conversion.
CAD Capable	Adds intelligence to drawing data by cleaning up the vector quality. Circles, arcs, and other geometric shapes are true and precise geometries. Lines are continuous and layered and objects are clear and orthogonally correct. Although representations are visually correct, the mathematical models created by CAD Capable conversions are not accurate.
CAD Perfect	All entities are dimensionally and orthogonally correct with fully editable vectors and text. Layers, blocks, symbols and line types are incorporated. This representation is required to provide a mathematically correct model for computer processing.
CALS	Computer-aided Acquisition and Logistic Support. The U.S. Department of Defense effort to standardize graphics interchange. Class I (technical illustration) and Class II (Mechanical Design) are IGES subsets. Class IV (raster) is based on CCITT Group IV raster format.
CCITT4	Developed by the consulting committee on Telephone and Telegraph Standardization. CCITT4 is widely used as a facsimile format. Used as the basis for CALS raster format, CCITT4 only supports black and white images (no gray scale).

CD ROM	Compact Disk Read Only Memory, a non-volatile optical data storage medium using the same physical format as audio compact discs, readable by a computer with a CD-ROM drive. A CD can store around 640 megabytes of data - about 12 billion bytes per pound weight.
Center Line Style	Dimensional call-out indication for the center/radius of a circle.
Color	In most CAD systems, color is most commonly used to represent line weights. Drawing colors are incorporated into layers, controlling the visibility of drawing components.
Comment/ Annotate	The ability to evaluate and highlight for future reference or to make annotations, approvals, and comments without the ability to change the original file. Annotations are associated with a specific item or location within a document such that the annotations are displayed whenever that point or area of the document is displayed.
Commercial and Government Entity (CAGE)	A five-character code that provides a unique activity identifier used by the Government for activity identification. This method of activity identification has also been widely adopted by industry. CAGE Codes are listed in Cataloging Guide H4/H8, available at the Defense Logistics Services Center, Federal Center Battle Creek, MI 49017-3084.
Commercial Carriers	Commercial Carriers are US Mail Priority, FedEx, UPS, Airborne, etc.
Commercial Off The Shelf (COTS)	Commercially available applications sold by vendors. COTS software is not intended to be customized or enhanced. Contract-negotiated software developed for a specific application is not COTS software.
Compression	The process of modifying data to remote excess information in such a manner as to be able to reverse the process and restore the information. This allows files to be “shrunk” for storage and transmittal and then “decompressed” for use.
Computer Graphics Metafile (CGM)	CGM data format is an International standard for the exchange of 2D illustration. CGM is a hybrid format, allowing both vector and raster information to be contained in the same file. CGM is a common format used for the representation of CAD and non-CAD vector information and is a standard for technical illustration software. CGM Version 4 is one of the non-proprietary formats available for the representation of vector information on the WWW. A Web version or profile has been issued as a recommendation by the W3C. The CGM standard is being supported by a wide range of organizations including Microsoft and Netscape as plug-ins into their browsers.
Contract	A mutually binding legal relationship obligating the seller to furnish the supplies or services and the buyer to pay for them. It includes all types of commitments that obligate the Government to an expenditure of appropriated funds and that, except as otherwise authorized, are in writing. In addition to bilateral instruments, contracts include (but are not limited to) awards and notices of awards; job orders or task letters issued under basic ordering agreements; letter contracts; orders, such as purchase orders, under which the contract becomes effective by written acceptance or performance; and bilateral contract modifications.
Contractor	An individual or organization outside the Government which has accepted any type of agreement or order for providing research, supplies, or services to a government agency.
Converted Document	A document migrated from one medium to another. The second-generation copy of an original document having been converted to digital form (digitized document).
Cost Analysis Tools	Methods (automated or manual) used to evaluate cost.
Data	Information used as a basis for reasoning, discussion, calculation, and decision making.
Data Information Blocks	Support documents, general documents, product/ asset configuration, configuration change control, configuration management action item status, project management, engineering parts list, basic document protection, basic files, and basic document representation is broken into data information input blocks. These data information blocks define the data and metadata that can reside in the database. There are 10 blocks.

Data Item (Data Elements)	A generic term for any kind of data. Example data items include models, documents, drawings, and metadata.
Data Item Description (DID)	A completed form that defines the data required of a contractor. The form specifically defines the data content, preparation instructions, format, and intended use. DID's are prepared in accordance with DOD-STD-963.
Department of Defense (DoD) Standard	A standard used to satisfy primarily multiple, military unique applications. There are five types of DoD standards: interface standards, design criteria standards, manufacturing process standards, standard practices, and test method standards.
Deskew	The examination of scanned images, correcting offset alignment and straight long lines which may surround the document.
Deviation	A specific written authorization to depart from a particular requirement(s) of an item's current approved configuration documentation for a specific number of units or a specified period of time, and to accept an item which is found to depart from specified requirements, but nevertheless is considered suitable for use "as is" or after repair by an approved method. A deviation differs from an engineering change in that an approved engineering change requires corresponding revision of the item's current approved documentation, whereas a deviation does not allow a revision of the item's current approved documentation.
Digital Data	A copy of data in a binary or numerical form that is interpreted by a computer. Often referred to as "electronic" data.
DIMCENT	An AutoCAD term for the center of a dimension.
Dimensions	Either the specifications of values that are derivable from shape aspects or the specifications of explicit values for locations and sizes of shape aspects. Dimensions may have limits that specify the minimum and maximum allowable values of the dimension.
DIMSCALE	A technique used to scale dimensions globally with engineering drawings. The DIMSCALE variable allows users to adjust settings for differently scaled drawings. DIMSCALE works as a multiplier for variables affecting dimension size, distance and offset.
Document	A self-contained body of information or data which can be packaged for delivery on a single medium. Some examples of documents are: drawings, reports, standards, data bases, application software, and engineering drawings. A document is a form of Product Data. (Reference: MIL-STD-2549)
Document Blocks	All document sheets which are a part of the conversion project. The document block will be divided by factors such as size and number, into smaller subsets called lots.
Document Conversion	The process of migrating a document from its original medium of storage to another medium of storage.
Document Lots	A subset of the document blocks.
Document Management	The life-cycle management of documents in accordance with approved records management policies, processes and procedures.
Document Representation	A set of digital files which, when viewed or printed together, collectively represent the entire document (for example, a set of raster files or a set of CAD files). A document may have more than one document representation. (Reference: MIL-STD-2549).
DOS	Disk Operating System. It is a master control program that is automatically run when the operator starts a PC. DOS stays in the computer all the time, allowing the operator to run a program and manage files.
Dots Per Inch (DPI)	A measure of resolution for printers, scanners and displays. Refers to the “image sharpness” of a document. Resolution also refers to the image-sharpness that printers and monitors are capable of reproducing.
Drawing Scale	The ratio of the size of the drawing as drawn to its full size. Drawings are usually drawn to a scale that depicts all details of the item clearly and accurately

Drawing Types	Mechanical, Electrical/Schematic, AEC, and GIS/Mapping (see individual definitions contained herein)
DXF	DXF data format is the most common interchange format for (<$1000) CAD systems. DXF is supported by many viewers and is one output format supported by most raster to vector conversion systems. The ability of a CAD system to accept DXF files is based upon the pre-processor implemented for that systems. (i.e. from DXF to Microstration). The DXF standard is an industry de-facto standard developed by AutoCAD for the electronics interchanger of files.
EIA	Electronics Industries Alliance, an organization founded to serve its membership, representing the entire electronic manufacturing community, encompassing the entire spectrum of US electronics manufacturing.
Electrical Drawings	An Engineering Drawing (as defined in ASME-Y14.24M) typically consisting of (but not limited to) the following types: Electrical/Electronic Diagrams (Functional Block, Single Line, Schematic or Circuit Design, Connection or Wiring Diagram, Wiring List, Logic Circuit) and/or Special Application Drawings (Wiring Harness, Cable Assembly, Printed Board, Microcircuit)
Email	The transmission of memos and messages over a network. User can send mail to a single recipient or broadcast it to multiple users. An email system requires a messaging system, which provides the store and forward capability and a mail program that provides the user interface with send and receive functions.
Encrypted	To encode data for security purposes.
End Product (in engineering drawings)	End product (end item)-An item, such as individual part of assembly, in its final of completed state
Engineering Change	A change to the current approved documentation of an item.
Engineering Drawing	An engineering document that discloses (directly or by reference) by pictorial or textural presentations, or combinations of both, the physical and functional *end product* requirements of an *item.*
Engineering Data	Documents and files such as engineering drawings, technical manuals, models, parts lists, wire lists, specifications, standards, reports, instructions, requirement, directives, engineering change action documents, diagrams, and schematics.
Entities	The representation of a set of real or abstract things (people, objects, places, events, ideas, combination of things, etc.) that are recognized as the same type because they share the same characteristics and can participate in the same relationship.
Facilities	Where a document is managed.
First Article	Includes pre-production models, initial production samples, test samples, first lots, pilot models and pilot lots. If it may be necessary to test a first article for conformance with specification requirements prior to regular production.
Floppy Disk	A soft magnetic disk, portable, because they can be removed from a disk drive. They're slower to access than hard disks, have less storage capacity, but they are much less expensive.
Formats	Specific characteristics (shape, size, style), organization, arrangement, or general layout of a collection of information.
Function	The action or actions which an item is designed to perform.
Functional Baseline	The approved functional configuration data (Reference: AMC-STD-2549A).
Functional Characteristics	Quantitative performance parameters and design constraints, including operational and logistic parameters and their respective tolerances. Functional characteristics include all performance parameters, such as range, speed, lethality, reliability, maintainability and safety.
Geometry	The lines, arcs, circles, surfaces, etc. that graphically describe the part being drawn.
GIS/Mapping	Geographic Information Systems (GIS): An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update,

Drawings	manipulate, analyze, and display all forms of geographically referenced information. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps.
Guide	A guidance document that enhances user awareness by providing engineering information; lessons learned; possible options to additional technical issues; classification of similar item, materials, or processes; interpretative direction and techniques; and any other type of guidance information that may help the Government or its' contractors in the design, construction, selection, management, support, or operation of systems, products, processes or services.
Hardware	Items made of material, such as weapons or computers and their components.
Hatching	The gradient, texture or pattern applied to drawings.
Human Resources	People
IEEE	Institute of Electrical and Electronic Engineers, an organization formed to provide a major entity that would offer increased responsiveness to the standards interests of IEEE societies and their representative industries.
IGES	Initial Graphics Exchange Format (IGES) neutral data file format is the most common translation software for higher end vector systems. The IGES specification is an ANSI approved standard for the transfer of product definition data among CAD/CAM Systems and application programs. IGES is a US national standard for CAD database translation between dissimilar systems. The present version of the standard is 5.1 while most CAD systems support this specification, the translation is only as good as the pre and post translators. There have been difficulties with "Flavor" of IGES. Flavors are caused by two different systems having dissimilar capabilities that cause trouble in the translation. Most raster to vector conversion systems support IGES as an output format.
Imaging	The technology that uses scanners to capture and convert documents to a digital form.
Information	Facts or knowledge communicated or received.
Intelligent Document	A document (in digital form) containing, in addition to its primary data, embedded data used to enhance use of the primary data and/or facilitate conveyance of the document's information.
Interoperability	The ability of systems, units, or forces to provide services from other systems, units, or forces and to use the services so exchanged to operate effectively together. The conditions achieved among communications-electronic systems or items of communications electronics equipment when information or services can be exchanged directly and satisfactorily between them an/or their users.
ISO	International Organization for Standardization, a non-governmental organization, whose mission is to promote the development of standardization and related activities in the world with a view to facilitate the international exchange of goods and services and to develop cooperation in the spares of intellectual, scientific, technical and economic activity.
Item (in engineering drawings)	A general term used to denote any unit of product or data including materials, parts, assemblies, equipment accessories, computer software, or documents which have entity.
Layers	An AutoCAD term for electronic drawing file overlays. Layers make it possible to separate different drawing elements so that they may be viewed in separate groups. This collection of displayable items aid in controlling visibility and presentation style.
Linux	A version of UNIX that runs on x86, Alpha and Power PC machines.
Magnetic Tape	A data storage medium consisting of a magnet usable oxide coating on a thin plastic strip, commonly used for backup and archiving.
Materiel	A generic term covering systems, equipment, stores, supplies and spares, including related documentation, manuals, computer hardware and software.
Mechanical Drawings	An Engineering Drawing (as defined in ASME-Y14.14M) typically consisting of (but not limited to) the following types: Layout, Detail, Assembly, Installation, Modifying, Arrangement, Control, and Mechanical schematic

Medium	The environment on which information resides (e.g., microfilm, electronic, paper, etc.).
Metadata	Elements of information that describe data, such as document identifier, date, owner, release level, format, keywords, data location, approval authorizations, part identifier, and part name. Metadata is a form of Product Data.
Metrics	Measures used to indicate progress or achievement.
Native Format	Native format is the storage format of the CAD System used in the conversion process.
Non-Converted Document	A document NOT selected for migration.
Non-Migratable Document	A document not converted due to technological limitations.
Non-Government Standard	A standard document developed by a private sector association, organization, or technical society which plans, develops, establishes or coordinates standards, specifications, guides, or related documents. The term does not include standards of industrial companies. Non-government standards adopted by the DoD are listed in the DoDISS.
Off-Line Archival Storage	Off-Line Archival Storage is the ability to store, catalog, and retrieve information stored on tapes, CD ROMs, or Iomega ZIP diskettes which satisfies as essential need of data intensive to organizations.
Operating System	The basic software running a computer, underneath such programs as word processing applications and spreadsheets.
Original Document	A document being managed as the organization record. The first generation version of a document from which copies or reproductions are made.
Parser	processing software which determines whether a document is valid or well formed; and passes a stream of "correct" code to a downstream browser.
Parts List	A compilation of engineering information pertaining to all items which when combined result in the complete engineering drawing.
Permanent Record	Records determined by NARA to have sufficient historical or other value to warrant preservation beyond the time they are needed for administrative, legal, or fiscal purposes.
Physical Properties	Quantitative and qualitative expressions of material features, such as composition, dimension, finishes, form, fit and their respective tolerances.
PMIG Policy	PMIG policy that provide criteria for migrating a document from one medium to another medium.
PMIG Tools	Hardware, software, and other devices used for migrating a document from one medium to another medium.
Policy	guidelines that provide criteria for migrating a document from one medium to another medium
Product Data	Documents files, and metadata related to a product's requirements, design, implementation and support. Includes, but is not limited to, documents and files such as engineering drawings, technical manuals, models, parts lists, wire lists, specifications, standards, reports, instructions, requirements, directives, engineering change action documents and product structures. Metadata includes data about documents and product structures.
Quality Assurance	A planned and systematic pattern of all actions necessary to provide adequate confidence that management and technical planning and controls are adequate to: 1) Establish correct technical requirements for design and manufacturing. 2) Manage and design activity standards, drawings, specifications or other documents referenced on drawings, lists or technical documents.
Raster	A matrix, constructed of orthogonally positioned rows and columns of discrete data points. The binary value of each data point indicates the presence or absence of a visual artifact. The aggregate of these artifacts displaying their assigned values, represents raster data.
Record	A record consists of information, regardless of medium, detailing the transaction of business.
Records	The planning, controlling, directing, organizing, training, promoting, and other managerial

Management	activities involving the life-cycle of information, including creation, maintenance (use, storage, retrieval) and disposal, regardless of media.
Requirements	Characteristics that identify the accomplishment levels needed to achieve specific objectives for a given set of conditions.
Revision Block	A textual area of information on a drawing which includes revision information from the original drawing.
Screen a Document	Review for compliance with conversion policy.
Skewed Images	A not focused, scanned image offset aligned and/or surrounded by straight, long lines.
Source Document	The original document that has passed through the conversion process.
Spatial Data	Information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology.
Specification	A document primarily for use in procurement, which specifies the work requirement for a project or program. It is used in conjunction with specification and standards as a basis for a contract. The SOW will be used to determine whether the contractor meets stated performance requirements.
Standard	A document that establishes uniform engineering or technical criteria, methods, processes and practices.
STEP	The Standard for Exchange of Product Data (STEP) format is an international format for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" of IGES, the STEP standard community developed Application Protocols (AP's).
STEP AP 203	AP 203, Configuration controlled Design, is the representation/exchanged of a three dimensional mechanical part design structure and shape data with associated configuration management information.
STEP AP 210	AP 210 is the representation for electrical printed circuit assembly (PCA) design information. The AP defines the information shared between design and manufacturing process-planning engineers for transforming a PCA detailed logical design into a manufacturable description. . The detailed logical design identifies and connects between the PCA components. The manufacturable description describes the physical realization of that logical design. This AP also includes information needed to support configuration management of the PCA product data.
STEP AP 224	AP 224 provides the mechanical product definition for Process planning using matching features.
Support Equipment	Equipment and computer software required to maintain, test, or operate a product or facility in its intended environment.
Symbol Libraries	A compilation of symbols. Symbols are a mark or character that are interpreted as the conventional sign of some object, idea, function or process.
System	A complete system includes all equipment, related facilities, material, software, services, and personnel required for its operation and support to the degree that it can be considered a self-sufficient unit in its intended operational environment.
Tailoring	The process by which individual requirements (sections, paragraphs, or sentences) of the selected specifications, standards, and related documents are evaluated to determine the extent to which they are most suitable for a specific system and equipment acquisition and the modification of these requirements to ensure that each achieves an optimal balance between operational needs and cost.
Technical Data	Recorded information (regardless of the form or method of recording) of a scientific or technical nature (including computer software documentation.)
Technical Data Package	A technical description of an item adequate for supporting an acquisition strategy, production, engineering, and logistics support. The description defines the required design configuration and procedures required to ensure adequacy of item performance. It consists of all applicable technical data such as drawings and associated lists, specifications,

	standards, performance requirements, quality assurance provisions and packaging details.
TIFF	Tagged Image File format, TIFF data format is the most common storage format for raster information. It was developed by Microsoft and Aldus as a non-proprietary format for use by scanners. This format is supported by most raster viewers and all of the raster to vector conversion systems. Most scanning systems will output files in the TIFF format.
Title Block	A textual area of information on a drawing which includes title information from the original drawing.
Tools	Hardware, software, and other devices used for migrating a document from one medium to another medium.
UNIX	A computer operating system design to be used by many people at the same time (multi-user) and has TCP/IP built in. It is the most common operating system for servers on the internet.
Validation	The process of determining that the requirements are the correct requirements and that they are complete. The system life cycle process may use requirements that are derived requirements in system validation.
Vector Graphics	The presentation of images stored as vector or other mathematical representations.
Vendor	A source from whom a purchased item is obtained. A seller
Video Tracing	An independent live video image, projected at 6x the original size onto a 19-inch CAD station monitor via proprietary software and hardware. The image, invisible to the CAD system programs, allows the CAD operator to draw, or trace, CAD object lines over the video image lines.
View Only	The ability to examine a document/data file without the ability to change it. This includes viewing selected portions of one or several documents as well as side-by-side comparisons of documents.
Web-based Access	The ability to access and use documents through a commercial web browser.
Web Enabled	Able to connect to or be used on the World Wide Web
Windows NT	Net Technology. An advanced, 32-bit operating system from Microsoft for x86 and Alpha CPUs. Introduced in 1993, NT doesn't use DOS, it is a self-contained operating system meaning it doesn't have to rely on another operating system in order for it to run, that runs 16 bit and 32 bit Windows applications as well as DOS applications. It has more advanced security system from previous windows operating systems as well as enhanced protection of critical operating system code, device drivers, and data from applications.
XREF	Means for linking various components of numerous drawings. XREF is predominately used to link elements within the same drawings. It is useful for assembling master drawings from component drawings-particularly during the design phase of a project when geometry changes impact on other design elements. However, when combined with blocks, provides an easy and convenient mechanism for updating drawings requiring identifying information changes.

15.0 APPENDIX C DATA CONVERSION FORMAT DEFINITIONS

Formats	Conversion Format Description
ASCII	American Standard Code for Information Interchange is the world wide standard for the code numberings used by computers to represent all the upper and lower-case Latin letters, numbers, punctuation, etc. There are 128 standard ASCII codes each of which can be represented by a seven digit binary number: 0000000 through 1111111.
AUTOCAD	A Computer Aided Design (CAD) software package for mechanical engineering marketed by Autodesk, Inc. CAD is the part of Computer Aided Engineering (CAE) concerning the drawing or physical layout steps of engineering design.
CALS Type 1	CALS Type 1 raster format is a subset of the CCITT Group 4 raster format. The CAL Type 1 data format is the DoD standard storage format for raster information. This format is supported by some raster viewers but very few of the raster to vector conversion systems. The JEDMICS repository format for raster data storage and viewing is CALS Type 1.
CCITT, Group 4	The efficient compression of scanned raster images. Uses the code from the Group 4 facsimile recommendation of International Telegraph & Telephonic Consultant Committee. A "filed" form is described by using the architecture nomenclature of International Standard: ISO 8613.
CGM	Computer Graphics Metafile, (CGM) data format, is an International standard for the exchange of 2D illustration. CGM is a hybrid format, allowing both vector and raster information to be contained in the same file. CGM is a common format used for the representation of non-CAD vector information and is the standard for technical illustration software. CGM Version 4 is the newly released standard for the representation of vector information on the WWW. The CGM standard is being supported by a wide range of organizations including Microsoft and Intergraph.
DXF	DXF data format is the most common storage format of information exchange for low end (<$1000) CAD systems. DXF is supported by many vector viewers and is an output format for most raster to vector conversion systems. The ability of a CAD system to accept DXF files is based upon the pre-processor implemented for that systems. (i.e. from DXF to MicroStation). The DXF standard is an industry de-facto standard developed by AutoCAD for the electronic transfer of files.
EDIF	Electronic Design Interchange Format (EDIF) data format is a format used to exchange design data between different CAD systems, and between CAD systems and Printed Circuit fabrication and assembly. The "Electronic" refers to the type of data, i.e. design data for electronic systems and not the mechanism of interchange. Of course, an EDIF file is machine-readable and may be interchanged electronically. Such CAD systems are often referred to as Electronic CAD (ECAD) systems or Electronic Design Automation Systems. The EDIF format is designed to be written and read by computer programs that constituent parts of EDA systems or tools, or by software that is part of front end manufacturing systems.
EPS	Encapsulated PostScript is a part of the first generation of Adobe Systems page description languages. A PostScript file that is intended to be incorporated into another PostScript file is called "encapsulated." EPS is designed to allow graphic material from one program to be transferred and used in a document produced by another program. However, EPS cannot include certain PostScript commands and are required to have a Bounding Box comment. ESP files are restricted in that they can only define a single page of information. In all other respects EPS files look like normal PostScript files.
Gerber Format	The industry standard for circuit broad manufacturing. RS-274-D is the technical name for Gerber Format, which is the standard photo plotting language. The format was first introduced in 1980, and has been upgraded several times since then. The most significant enhancement was the addition of embedded aperture codes in 1991. This feature allows each file to be completely self defining, needing no other accompanying documents for processing. These files include the data for all artwork layers, aperture list or lists of all layers and drill file in Gerber format.
HTML	Hypertext Markup Language is a coding language used to format hypertext documents on the World Wide Web. HTML is a "tag" embedded format built on SGML. It supports some standard characters from SGML and other non-ASCII. characters as well. The World Wide Web Consortium (W3C) is the standards body for HTML.
IGES	Initial Graphics Exchange Format (IGES) neutral data file format is the most common translation software for higher end vector systems. The IGES specification is an ANSI approved standard for the transfer of product definition data among CAD/CAM Systems and application programs. IGES is a US national standard for CAD database translation between dissimilar systems. The present version of the standard is 5.1. While most CAD systems support this specification, the translation is only as good as the pre and post translators. There have been difficulties with "Flavor" of IGES. Flavors are caused by two different systems having dissimilar capabilities that cause trouble in the translation. Most raster to vector conversion systems support IGES as an output format.
PDF	Portable Document Format, PDF, is the third generation of Adobe Systems page description language. Essentially, PDF is EPS, with strict rules. For example, formatting and extra header and footers. PDF allows for good typographical control and precise alignment of all page elements. PDF has good control over basic entities (i.e. text, lines, and bezier splines), but doesn't allow for higher entities (i.e. arcs and circles). This means that the interpreter can concentrate on a very small entity set, bit it also means that arcs and circles can be very badly behaved as the mathematics can easily break down. PDF is extremely large and verbose, and is best used with dedicated T1 lines by all users.
SGML	Standard Generalized Markup Language, defined in "ISO 8879:1986," is a generic markup language for representing documents. SGML represents document content data and structure, which allows document-based information to be shared and reused across applications and platforms. SGML defines elements in a DTD (Document Type Definition), similar to data base field definitions. The DTD allows SGML documents to be searched, printed, or programmatically manipulated by SGML-aware applications.

STEP AP 201	The Standard for the Exchange of Product Data (STEP) format is an international format for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" of IGES, the STEP standard community developed Application Protocols (AP's). AP 201, Explicit Draughting, is the representation of a two-dimensional drawing of a product.
STEP AP 202	The Standard for the Exchange of Product Data (STEP) format is an international format for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" or IGES, the STEP standard community developed Application Protocols. (AP's). AP 202, Associative Drafting, is the exchange of drawings of parts with "smart" dimensions.
STEP AP 203	The Standard for the Exchange of Product Data (STEP) format is an international format for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" of IGES, the STEP standard community developed Application Protocols (AP's). AP 203, Configuration Controlled Design, is the representation/exchange of a three dimensional mechanical part design structure and shape data with associated configuration management information.
STEP AP 210	The Standard for the Exchange of Product Data (STEP) format is an international format for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" of IGES, the STEP standard community developed Application Protocols. The AP 210 is the representation for electrical printed circuit assembly (PCA) design information. The AP defines the information shared between design and manufacturing process planning engineers for transforming a PCA detailed logical design into a manufacturable description. The detailed logical design identifies and connects between the PCA components. The manufacturable description describes the physical realization of that logical design. This AP also includes information needed to support configuration management of the PCA product data.
STEP AP 212	The Standard for the Exchange of Product Data (STEP) data format is an international for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" or IGES, the STEP standard community developed Application Protocols. The AP 212 is the representation for the exchange for design information of electrotechnical equipment used in plants, systems and devices. This AP allows for the description of information shared between the parties involved in the design, the installation and the commissioning of the apparatus. Design is understood as a process of combining components such as relays, programmable logic controllers, software to a system.
STEP AP 224	The Standard for the Exchange of Product Data (STEP) data format is an international standard for the exchange of CAD files. Because of the variety of CAD files and the problems associated with the "flavoring" or IGES, the STEP standard community developed Application Protocols. The AP 224 provides the mechanical product definition for process planning using machining features.
TIFF	Tagged Image File Format, TIFF data format is the most common storage format for raster information. It was developed by Microsoft and Aldus as a non-proprietary format for use by scanners. This format is supported by most raster viewers and all of the raster to vector conversion systems. Most scanning system will output files in the TIFF format.

Appendix D Sample
Detailed Definition Specification
Mechanical 2D, CAD Perfect (M2DCC)

Program Managers Implementation Guide (PMIG)

Prepared by Hampton University &
Global Technology LLC for
Integraph Corporation. Contract # N66032-94-D-0012

This is only an abbreviated version of the DDS. This, and all other DDS's in full length, can be found on the PRIME software wizard.

TABLE OF CONTENTS

Preface ……67
1.0 INTRODUCTION ……67
1.1 ACRONYMS ……67
1.2 SCOPE ……..69
1.3 PURPOSE/CONVERSION LEVEL ……...69
1.4 BACKGROUND ……70
1.5 Interchangeable Terminology ……70
1.6 TARGET SYSTEMS/ FILE FORMATS …… 70
1.7 FILE FORMAT …… 73
1.8 DOCUMENTATION…….. 74
1.9 HARD COPY ……...74
1.10 OWNERSHIP …… 75
1.11 ADDITIONS/REVISIONS 75
2.0 DRAWING FILE ORGANIZATION
2.1 DESIGN CUBE
2.1.1 Available Drawing Area
2.2 FILE ACCURACY (UNITS)
2.3 ORIGIN (GLOBAL ORIGIN)
2.4 ELECTRONIC DRAWING FILE NAMING CONVENTIONS
2.5 INDUSTRY STANDARD MODEL FILE, NAMING CONVENTION
2.6 INDUSTRY STANDARD SHEET FILE NAMING CONVENTION
2.7 PMIG OPTIONAL MODEL FILE NAMING CONVENTION
2.8 DETAILED DEFINITION SPECIFICATION OPTIONAL SHEET FILE NAMING CONVENTION
2.9 COORDINATION BETWEEN SHEET FILE NAME AND SHEET IDENTIFIER
3.0 GRAPHIC CONTENT
3.1 DRAWING GRAPHICS
3.2 LINE WIDTHS:
3.3 LINE TYPES/STYLES:
3.4 LINE COLOR
3.5 SCREENING (HALFTONING)
3.6 TEXT STYLES/FONTS
3.7 PLOTTING
3.8 BORDER SHEETS
3.9 SHEET SIZES
3.10 TITLE BLOCK
3.11 ISSUE BLOCK
3.12 MANAGEMENT BLOCK
3.13 PROJECT IDENTIFICATION BLOCK/SHEET TITLE BLOCK
3.14 SHEET IDENTIFICATION BLOCK
3.15 DRAWING SCALES
3.16 DIMENSIONING IN METRIC (SI)
3.17 MILLIMETERS
3.18 METERS
3.19 LARGE UNITS OF MEASURE
3.20 DUAL UNITS
4.0 LEVEL/LAYER ASSIGNMENTS
4.1 LEVELS/LAYERS
4.2 LEVEL/LAYER NAMING CONVENTIONS
4.3 ISO FORMAT
4.4 MODEL FILES
4.5 LEVEL/LAYER ASSIGNMENT TABLES

5.0 DELIVERABLES AND DATA EXCHANGE
5.1 DELIVERY MEDIA
6.0 REFERENCES

LIST OF TABLES

1. Table 1 – Interchangeable Terminology.....5
2. Table 2 – MicroStation Working Units and Global Origins 9
3. Table 3 – DDS Discipline Codes/Designators 11
4. Table 4 – DDS Standard Drawing Type Codes.....12
5. Table 5 – DDS Sheet Type Codes/Designators.....13
6. Table 6 – DDS Optional Discipline Type Codes/Designators 15
7. Table 7 – DDS Optional Drawing Type Codes 16
8. Table 8 – Comparison of Line Widths.....18
9. Table 9 – Standard Line Types/Styles.....19
10. Table 10 – Screen Color Comparison and Associated Line Widths.....20
11. Table 11 – Halftone Colors 23
12. NOT USED
13. Table 13 – ISO.ANSI. Sheet Size Comparison 24
14. Table 14 – Drawing Scales.....28
15. Table 15 – Inch-pound Text Sizes 29
16. Table 16 – Metric Text Sizes.....29

LIST OF FIGURES

1. Figure 1 – Available Drawing Area.....8
3. Figure 2 – NOT USED
3. Figure 3 – AutoCAD's Drawing File Origin.....10
4. Figure 4 – Sheet File Composition 10
5. Figure 5 – PMIG Specification Model File Naming Convention.....11
6. Figure 6 – DDS Sheet Filing Name Convention 13
7. Figure 7 – Typical File Structure.....14
8. Figure 8 – Detailed Definition Specification Optional Model File Naming Convention 14
9. Figure 9 – Detailed Definition Specification Optional Sheet File Naming Convention.....17

10. Figure 10 – NOT USED
11. Figure 11 – NOT USED
12. Figure 12 – Designer Identification Block (Type) 25
13. Figure 13 – Issue Block (Typ.) 26
14. Figure 14 – Management Block (Typ.) 26
15. Figure 15 – Project Identification Block/Sheet Title Block 26
16. Figure 16 – Sheet Identification Block 26
17. Figure 17 – Dimension in Millimeters. 30
18. Figure 18 – Dimension in Meters. 30

19. Figure 19 – Proper Dimension Presentations for Metric Measurements with four or more Digits 31
20. Figure 20 – NOT USED
21. Figure 21 – Typical Levels/Layers Contained in a Sheet File..... 32
22. Figure 22 – Sheet- and Model-Specific Information 33
23. Figure 23 – Level/Layer Naming Format Methods 34
24. Figure 24 – ISO 13567-2 Level/Layer Naming Method..... 35

LIST OF APPENDICES

1. Appendix A – Color Comparison and Associated Line Widths..... 39-44
2. Appendix B – Model File Type Level/Layer Assignment Tables…….. 45-49
3. Appendix C – Sheet File Model Level/Layer Assignment Tables…… 50-55
4. Appendix D – CAD Symbol Libraries……..56-114

- D1 - General Drafting Lines Library
- D2 - General Drafting Object Library
- D3 – General Drafting Symbols Library
- D4 - Utilities Symbols Library
- D5 - Utilities Patterns Library
- D6 - Plumbing Lines Library
- D7 - Fire Suppression Lines Library
- D8 - Fire Suppression Symbols Library
- D9 - Plumbing Lines Library

- D10 - Plumbing Symbols Library
- D11 - Fire Suppression Symbols Library

Preface

This Detailed Definition Specification" (DDS) has been developed by the Automated Data Conversion System (ADCS) & Intergraph Corporation to reduce redundant Computer-Aided Design and Drafting (CADD) standardization efforts within the Army, Navy, Air Force, Marines, and Corps of Engineers. This specification is part of an initiative to consolidate existing CADD drafting specifications and to develop a data specification that address the entire life cycle of facilities within the Department of Defense. This Specification is a part of a set of specifications being developed by the ADCS. Additional specifications include the following for the Mechanical Engineering Discipline:

a. Mechanical 2D CAD Capable

b. Mechanical 3D CAD Perfect

c. Uni-discipline JEDMICS - .C4, CALS (Raster Only)

Chapters 2-4 of this specification address topics such as presentation graphics, level/layer assignments, electronic file naming, and specification symbology. This specification concentrates on model and sheet file level/layer names, color comparison with associated line widths, as well as A/E/C/CADD symbology. As this specification evolves, it will also include nongraphic database Specifications. The Detailed Definition Specification primary goal is to develop a CADD specification that is generic enough to operate under various CADD software packages (such as MicroStation and AutoCAD) and incorporate existing industry/national specifications.

In the final phase of developing this specification platform-specific software will be provided to implement the specification on hardware platforms available through the Navy's Installation Management/Facilities CAD2 (IM/FCAD2) contract.[1]

1.0 INTRODUCTION

1.1 Acronyms

First, a few useful acronyms:

? **A/E** – Architectural-Engineer.

? **AIA** – American Institute of Architects.

? **ANSI** – American National Standards Institute.

[1] The installation Management/Facilities CAD2 (IM/FCAD2) contract is a computer hardware/software/services contract awarded to both Tracor Incorporated and Intergraph Corporation, in 1993.

? **ASTM** – American Society for testing and Materials.

? **CAD** – Computer-Aided Drafting.

? **CADD** – Computer-Aided Design and Drafting.

? **CSI** – Construction Specifications Institute.

? **DoD** – Department of Defense.

? **FM** – Facility Management.

? **IAI** – International Alliance for Interoperability.

? **IFC** – Industry Foundation Class.

? **IOC** – Intelligent Object Class.

? **ISO** – International Organization for Standardization.

? **SI** – International System of Units (Le Système International d'Unitès).

? **TSTC** – Tri-Service CADD/GIS Technology Center.

? **UDS** – Uniform Drawing System.

? **CGM** – Computer Graphics Metafile, (CGM) data format, is an International standard for the exchange of 2D illustration.

? **DXF** – Data format is the most common storage of information exchange between CAD Systems, A CAD drawing file format.

? **IGES** – Initial Graphics Exchange Format (IGES) neutral data file format is the most common translation software for higher end vector systems.

? **TIFF** – Tagged Image File Format, TIFF data format is the most common storage format for raster information.

? **INDEX.DLF** – A DLF ASCII file will accompany a set of engineering data file.

? **CALS, Type 1** – CALS Type 1 raster format is a subset of the CCITT Group 4 raster format as defined in MIL–STD 1840–A.

? **CCITT, Group 4** – The efficient compression of standard raster images.

? **EDMS** – Engineering Data Management Systems.

? **IPO** – IGES/PDES Organization.

? **DWG** – A CAD drawing FILE FORMAT.

? **DGN** – A CAD drawing FILE FORMAT.

? **PDES** – Product Data Exchange using STEP.

? **STEP** – Standard for the exchange of Product Model Data (ISO 10303).

? **STEP AP 203** – configuration-Controlled 3D Designs of Mechanical Parts and Assemblies.

? **STEP AP 209-** Is the representation for Composite and Metallic Structural Analysis and Related Design.

- **STEP AP 213-** Is the representation for Numerical Control Process Plans for Machined Parts
- **STEP AP 214-** Is the representation for Core Data for Automotive Mechanical Design Processes
- **STEP AP 215-** Is the representation for Ship Arrangement
- **STEP AP 216-** Is the representation for Ship Moulded Forms
- **STEP AP 217-** Is the representation for Ship Piping
- **STEP AP 218-** Is the representation for Ship Structures
- **STEP AP 219-** Is the representation for Mange Dimensional Inspection of Solid Parts or Assemblies
- **STEP AP 221-** Is the representation for Functional Data and Their Schematic Representation for Process Plants
- **STEP AP 223-** Is the representation for Exchange of Design and Manufacturing Product Information for Cast Parts
- **STEP AP 224** – Mechanical Product Definition for Process Planning Using Machining Features.
- **STEP AP 226-** Is the representation for Ship Mechanical Systems
- **STEP AP 230-** Is the representation for Building Structural Frame: Steelwork
- **STEP AP 235-** Is the representation for Materials Information for the Design and Verification of Products

1.2 Scope

This specification provides guidance and procedures for preparing Computer-Aided Design and Drafting (CADD) products within the Department of Defense (DoD).

This Detailed Definition Specification Package is a mandatory part of the Program Managers Implementation Guide (PMIG). The information contained herein is intended for compliance.

1.3 Purpose/Conversion Level

The purpose of this specification is to set basic CADD specifications to ensure consistent electronic deliverables (products) within the DoD. These consistent deliverables are part of a comprehensive installation life-cycle management strategy. This specification sets a CADD specification for the mechanical engineering, discipline of facilities development. This specification will be integrated with other specifications initiatives by the PMIG and the Automated Data Conversion System Contract.

3D CAD Perfect – The use of this specification should result in a CAD Perfect data file. All entities should be dimensionally and orthogonally correct with fully editable vectors and text. Layers, blocks, symbols, and line types should be incorporated. This representation is required to provide a mathematically correct, for computer processing, CAD Perfect Data Format. All dimensions shall be mathematically accurate to a minimum of four decimal places.

1.4 Background

In 1995, the combined resources of the Tri-Service CADD/GIS Technology Center, the American Institute of Architects (AIA), the Construction Specifications Institute (CSI), the United States Coast Guard, the Sheet Metal and Air Conditioning Contractors National Association (SMACNA), the General Services Administration (GSA), and the National Institute of Building Sciences' (NIBS) Facility Information Council began an effort to develop a single CADD specification for the United States. Working together, these organizations agreed to develop an integrated set of documents that collectively would represent the United States National CADD Specification. This Detailed Definition Specification has been developed utilizing the concepts of Tri-Service CADD/GIS Technology Center {http//tsc.wes.army.mil.}

The immediate benefits of CADD specifications are many: consistent CADD products for customers, uniform requirements for A/E deliverables, sharing of products and expertise, collection, manipulation, and expertise, and database information.

To consolidate these efforts into a single specification, Intergraph Corporation was tasked to develop specifications for all Engineering disciplines, facility management, and GIS planning. This specification presents the ADCS CADD requirements for Mechanical Design, Machinery, and all other related Mechanical documents i.e., Piping Plans and Schematics. To facilitate the use of this specification, a supplementary software package will be developed that automates the use of the specification. This software will allow the operator to select preset system variables to align with the requirements of the "PMIG specification" to ensure consistent and easy compliance specification.

1.5 Interchangeable Terminology

Within the various commercially available CADD systems, many identical or related concepts are given different names. To aid users of this specification, some instances of related or interchangeable terminology used in MicroStation and AutoCAD are listed in Table 1.

1.6 Target Systems/ File Formats

This specification is not targeted toward any specific CADD systems. However, to ensure successful translations among CADD applications, certain system-specific characteristics were considered and the specification adjusted accordingly. In preparing the standard, several baseline decisions were made:

? The specification must be applicable to commercially available CADD packages. AutoCAD 2002 Release and MicroStation Version 95 and SE were chosen based on

their prevalence in the DoD Tri-Services and their availability to the Tri-Service through the Installation Management- /Facilities CAD2 contract.

? The specification is based on CADD applications that utilize layer/level names and reference files.

? This specification requires every final plotted drawing sheet to have its own separate electronic drawing file.

TABLE 1 Interchangeable Terminology		
MicroStation	**AutoCAD**	**Definition**
Integer d/b	64-bit floating point d/b	The method for storing attribute data.
Disk-based	Memory-based	Where drawing data are stored until the active file is closed.
Auxiliary Coordinate System (ACS)	User Coordinator System (UCS)	An XYZ coordinate system where the origin is selected by the user.
Active	Current	File or object in use.
Cell	Block	Single or multiple entities grouped together to create a single element.
Dimension Attributes	Dimensions Styles	Controls the appearance of dimension elements.
.dgn	.dwg	A DOS-based extension for drawing files.
Drop	Explode	Converts an element into multiple entities.
Dynamic Update	Dragmode/rubberbanding	Display of element (s) being drawn or modified as pointer/cursor moves on the screen.
Element	Entity	A single object contained in a drawing.
Fit	Zoom All	Displays all graphics currently in the drawing.
Global Origin/Design Cube	World Coordinate System/Origin	Define the location(s) of all entities in a design/drawing using the Cartesian coordinate system.
Identify/Accept	Select/pick	Entity or entities chosen for manipulation or modification.
Image	Slide	A screen capture of graphics in raster format.
Key Entry Field	Command Prompt	Allows for keyboard input from users.
Key Point Snap	Object Snap (Osnap)	Controls the selection location for entities.
Levels	Layers	Used as transparent overlays for display graphics.
Line Style	Linetype	Defines the appearance of lines.
Linestring	Polyline	Connected line segments.
Locate Tolerance	Pickbox	Identification/selection limits for the drawing cursor.
MDL/Visual BASIC	ARX/AtuoLISP	System-specific command language.
Message Field	Status Line	Displays current drawing status and/or text output from the application.
Monument Point	Insertion Point	Benchmark point used to place objects in a drawing.
Move Element	Move	Relocation of entities.

Patterning	Hatching	To fill an area within a drawing with a symbolic texture.
Precision Key in	Coordinate Entry	User-defined XYZ values.
Reference file	External Reference	A design/drawing file attached to an active drawing.
Seed File	Prototype	A drawing design template file.
Tentative Data/point	Pointing/Pick Point	A point within the drawing selected using a pointing device.
Update	Redraw/Regenerate	Refreshes screen display.

1.7 File Format

All digital files should be delivered in a format that is directly readable and compatible with the installation's CADD software and platforms without conversion. Before a file is placed on the delivery digital media, the following procedures should be performed:

A. Remove all extraneous graphics outside the border area, and set the active parameters to a standard setting or those in the seed/prototype file.

B. Make sure all reference (external reference) files are attached without device or directory specifications.

C. Compress and reduce all files using the appropriate utilities. A digital media copy of the decompression utility should be provided with the deliverable media, if appropriate.

D. Include all files, both graphic and non-graphic, required for the project (e.g., color tables, pen tables, font libraries, cell/block libraries, user command files plot files, etc.).

E. Make sure that all support files such as those listed in d are in the same directory and that references to those files do not include device or directory specifications.

F. Include any standard sheets (i. e, abbreviation sheets, standard symbol sheets, etc.) necessary for a complete project.

G. Document any nonstandard fonts, tables, symbols, etc , developed by the Contractor or not provided with the Government-furnished material.

1.8 Documentation

Complete documentation (e.g., data input procedures), pen settings, lock settings, reference files, cells, level assignments, and history (e.g. when developed/modified) information for each tile should be included on level/layer **-ANNO-NPLT (** represents the design discipline.) Documentation of the plot for each drawing is needed to duplicate the plot at a later date and should be provided with the deliverables./

1.9 Hard Copy

Contractor shall provide one full-size (or half-size at the preference of the installation) hard copy (usually Mylar, paper, or vellum) of each finished drawing with the final submittal. A hard copy of the documentation for each file should also be provided with each submittal on the size and type of media as preferred by the installation and negotiated in the Contractor's contract.

1.10 Ownership

The Government's rights to ownership of the appropriate digital data and other deliverables developed by the Contractor under the contract must be clearly defined in the technical contract provisions. The Government has a legal right to demand unrestricted ownership to all data, designs, and materials for which the Government has paid 100 percent of the development cost. If the Contractor has to develop data, designs, or materials above and beyond what the Government specifies and pays for 100 percent, then the Contractor owns the rights to that percentage.

A statement similar to the following should be included in each Subcontractor to Contractors:

> *The Government, for itself and such others as it deems appropriate, will have unlimited rights under this contract to all information and materials developed under this contract and furnished to the Government and documentation thereof reports and listings, and all other items pertaining to the work and services pursuant to this agreement including any copyright. Unlimited rights under this contract are rights to use, duplicate, or disclose data, and information, in whole or in part in any manner and for any purpose whatsoever without compensation to or approval from the Contractor. The Government will at all reasonable times have the right to inspect the work and will have access to and the right to make copies of the above-mentioned items. All digital files and data, and other products generated under this contract, shall become the property of the Government By reference, the following DFAR clauses are included in this contract as a part of the requirements herein:*
>
> a. *DFAR 252 227-7013, "Right in Technical Data and Computer Software.*
>
> b. *DFAR 252 227-7018, "Restrictive Markings on Technical Data.*
>
> c. *DFAR 252 227-7019, "Identification of Restricted Right Computer Software.*
>
> d. *DFAR 252 227-7028, "Requirement for Technical Data Representation.*
>
> e. *DFAR 252 227-7037, "Validation of Restrictive Markings on Technical Data.*

1.11 Additions/Revisions

This specification is intended to be neither static nor all-inclusive and thus will be updated

and enhanced as appropriate. Suggestions for improvements are strongly encouraged so that subsequent updates will reflect the input and needs of CADD users within DoD.

17.0 Appendix E

Project Related Information Management and Execution (PRMIE)

Automated Document Conversion Strategy
Performance Specification for:
PMIG

PRIME PERFORMANCE

Foreword

This *PMIG* Performance Specification provides the contractor with specific procurement requirements for technical data conversion. It allows individual organizations to specify requirements while conforming to an overall conversion requirement. The Performance Specification is necessary to secure full, accurate, and complete conversion of engineering related documents from hard copy or digital raster format to a vector format to be used in Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) processes.

The DoD has an expressed goal to convert technical documents required for acquisition, maintenance and material management. This Performance Specification addresses specific requirements for converting engineering documents.

PRIME PMIG PERFORMANCE

Scope

This document includes performance requirements for the DOD Automated Document Conversion System (). It defines functional requirements for as applied to engineering documents and data. It defines contractor requirements for the conversion of engineering documents and related technical data.

Purpose

The purpose of this document is to provide contractors with specific requirements needed for converting documents into digital form in the most cost-effective manner. This Performance Specification shall be delivered to the contractor to ensure the contractor meets the requirements herein stated.

Procurement Requirements

Functional Types

The conversion contractor shall be provided **Mechanical** drawings and the number and quality by size is listed in the following table:

NUMBER AND QUALITY OF SHEETS PER SIZE

	A	B	C	D	E	F	G	H	J	Other
Number	1	1	2	0	0	0	0	0	0	0
Quality	G	G	G							

Quality Legend: H-High E-Excellent G-Good F-Fair L-Low P-Poor

Input Format

The Contractor shall be provided with **Paper** documents. The information to be converted shall be provided to the contractor as **Paper**. Delivery of documents shall be via **Commercial Carrier**

Document Conversion Requirement

Engineering documents delivered to the contractor shall be converted from existing format to **2D CAD Perfect** A complete definition of the conversion requirements is available in the Detailed Definition Package for **2D CAD Perfect** All requirements specified in the Detailed Definition Package shall be met to satisfy this requirement.

Document Conversion Format

The data shall be converted into the following Vector Formats:

AP20	C4	DGN	DRG	DWF	DWG	DXF	IGES	MODL	VRML
NO	NO	NO	NO	NO	NO	NO	YES	NO	NO

Metadata

Contractor shall provide associated information (metadata) about the document conversion in a DLF ASCII format. All required data elements specified in the metadata section must be met to satisfy this requirement. There are required data elements for JEDMICS/CDEX, Data, and Product Data specified in the attached appendix.

8/20/01

PRIME PMIG PERFORMANCE SPECIFICATION

Document Conversion Media

The converted information shall be returned to the Program Manager via **Optical Disc (CD-ROM, DVD, Etc.)**The media shall be labeled with a **Electronic Tag**. This and other requirements are detailed on the Shipping Form that accompanies the document lots delivered to the contractor.

Delivery Specification

The contractor shall inspect all documents submitted for conversion for sheet legibility and assurance that all documents and sheets listed on the shipping form have been provided. Discrepancies shall be identified and immediately reported to the Program Manager for resolution. The Program Manager will make every effort to respond within 7 working days.

Do not convert drawings marked as obsolete, or drawings already in a CAD format. These drawings should be returned to the Program Manager and listed on the shipping form.

After the conversion process has been initiated, areas of potential misinterpretation of information shall be described on the zero layer of the converted drawing. These areas should also be noted on a shipping form returned with the documents to the Program Manager.

A proof print of each converted drawing in the Lot shall be provided along with a shipping form that identifies at a minimum, lot(s) number(s) being returned, the associated drawing numbers, sheet numbers, and drawing sizes. The contractor shall notify the Program Manager via e-mail of the ship date. Multiple Lots may be sent in one shipment, but Lot approval will remain at one Lot per week. Electronic CAD files shall not be required for the initial submission. After the returned Lot has been inspected, the conversion contractor shall be notified via e-mail of any errors found.

The converted information shall be returned to the government via **Bonded Messenger** as specified on the shipping form for quality assurance review and final acceptance. Program manager will be allotted 30 days for drawing review.

Deliveries shall be performed weekly, with each lot containing approximately **200** drawings,**200** minimum, and **200**maximum. Converted drawings shall be delivered with all associated sheets in a given lot. The contractor shall replace drawings lost or damaged during shipment or delivery.

Original hard copy drawings must be returned with delivery of the converted drawings and shall contain the files and index data of the submitted drawings. Upon notification of Lot approval, the contractor shall provide final delivery.

Disposition of Input Data

The original documents shall be **Shredded/Erased** according to instructions detailed on the shipping form.

Safety and Security Documents

Contractor shall be responsible for maintaining document safety and document security according to instructions on the shipping form.

Document Lots

The contractor shall track all documents and Lots provided by the Program Manager. The contractor shall include date received, document type, storage location, status, and contract to be converted using the shipping form. The **Mechanical** **2D CAD Perfect** Detailed Definition Package, if included, shall allow the Program Manager to specify the requirements for all documents under contract by the contractor. The system may be manual or electronic.

APPENDIX - METADATA

Metadata	JEDMICS-CDEX Metadata	PDM Metadata
ADC_ContractorPOC	IDX_DfisSourceCage	PD_RecordEnd
ADC_ConversionContractor	IDX_DfisVersion	PD_EngineerName
ADC_ConversionData	IDX_FileExtension	
ADC_DetailedDefinitionPkg	IDX_FileName	
ADC_ConversionType	IDX_FilePath	
	IDX_MediaVolumeID	
	JMX_AccDocCage	
	JMX_AccDocNumber	
	JMX_AccDocRevision	
	JMX_AccDocType	
	JMX_DocCage	
	JMX_DocNumber	
	JMX_DocRevision	
	JMX_DocSheetRevision	
	JMX_DocType	
	JMX_DocumentSize	
	JMX_FileType	
	JMX_ForeignSecure	
	JMX_FrameNumber	
	JMX_Nuclear	
	JMX_NumberOfFrames	
	JMX_Rights	
	JMX_SecurityLevel	
	JMX_SheetNumber	
	JMX_Subsafe	

‘

18.0 APPENDIX F Document Conversion Strategy USER WORKSHEET

WEAPON SYSTEM	CONTRACT NUMBER	**Document Conversion Strategy USER WORKSHEET**
ORGANIZATION	DATE	

The following questions are designed to help Program Managers compile the information required to answer the questions in either the Project Related Information Management and Execution (PRIME Wizard) or the PMIG Guidance Specification Word document. The questions in this section correspond to steps 1 through 11 of the PRIME Wizard and the corresponding output on the First Article Specification to the Contractor.

Step/line No.	Document Conversion Process	User Input	
2. **PRIME**	Functional Type of Documents?		Mechanical
			Electrical
			Architectural/Civil
			GIS Mapping
3. **PRIME**	Number of Engineering Documents?		A
			B
			C
			D
			E
			F
			G
			H
			J
			K
5.	How Will Converted Document Be Used?		Design
			Design Analysis
			Production
			Procurement
			Support/Maintenance
			Technical Manuals
			Illustrations
			Specifications
7.	Type of Access of Documents?		View Only
			Comment/Annotate
			Process/extract/transform
			Edit/update/maintain
			Archive
7.	Identify User Infrastructure (Operating System)		DOS
			Window NT/9X
			UNIX
7 **PRIME**	Identify Existing Input Format of All Documents		Paper
			Mylar
			Aperture Cards
			Microfiche
			TIFF
			CALS Type 1
			JEDMICS

7 **PRIME**	Delivery Media to Contractor (If Electronic)		CD-ROM
			Network (Govt.)
			Disk (ZIP Drive)
			Tape (DAT Drive)
			Other
7 **PRIME**	Delivery Method to Contractor		US Mail - First Class Ground
			Commercial Carrier
			Hand Delivery
			Bonded Messenger
			Electronic Transfer
7. **PRIME**	Converted Output Document Type		Mechanical 2D CAD Capable
			Mechanical 2D CAD Perfect
			Mechanical 3D CAD Perfect
			Electrical 2D CAD Capable
			Electrical 2D CAD Perfect
			Electrical Schematic
			Architectural 2D CAD Capable
			Architectural 2D CAD Perfect
			Architectural 3D CAD Perfect
			Civil 2D CAD Capable
			Civil 2D CAD Perfect
			Civil 3D CAD Perfect
			GIS/Mapping 2D CAD Capable
			GIS/Mapping 2D CAD Perfect
			GIS/Mapping 3D CAD Perfect
8. **PRIME**	Conversion Output Data Format		Vector Formats
			C4 / DWG
			Native / IGES
			DXF / Step AP 203
			IGES / DGN
9.	Metadata		JEDMICS/CDEX
			DoD
			Product Data (PM)
11 **PRIME**	Output Media to Program Manager		CD-ROM
			Disk (ZIP Drive)
			Tape (DAT Drive)
			Network (ADCS WEB Site)
11 **PRIME**	Method of Labeling Output Media		Printed Label
			Print/ID
			Electronic Tag
			URL Tag
			Other
11 **PRIME**	Delivery Method to Program Manager		US Mail - First Class Ground
			Commercial Carrier
			Government Personnel
			Bonded Messenger
			Electronic Transfer
11 **PRIME**	Disposition of Originals		Return Document

19.0 APPENDIX G METADATA FILE STRUCTURE

DFIS Seq	JEDMICS CDEX Data File Index Structure(DFIS)		Maxi Data Chara	Required or Optional	Notes
	DATA ELEMENT	Purpose			
1	JMX_BaseDocNumber	Document Number (Base Document)	32	R	(13)
2	JMX_BaseDocCage	Commercial and Govn't Entries Reference (Base Doc)	5	R	(13)
3	JMX_BaseDocType	Document Type (Base Doc)	2	R	(4) (13)
4	JMX_DocumentSize	Size of drawing (May Be A Through K and R except I)	2	R	
5	JMX_BaseDocRevision	Document Revision (Base Document)	2	R(4)(6)	(11) (13)
6	JMX_DocumentRevDate	Document Revision Date	18	O	(7) (12)
7	JMX_DocumentTitle	Document Title	40	O	
8	JMX_SheetNumber	Sheet Number of Document	12	R	
9	JMX_NumberOfSheets	Number of Sheets for Document	4	R	(15)
10	JMX_BaseDocSheetRevision	Sheet Revision (Base Document)	2	R (4)	(11)(13)
11	JMX_FrameNumber	Frame Number	4	R	
12	JMX_NumberOfFrames	Number of Frames for Sheet	4	R	
13	JMX_FileType	Designator for the Data Format Type of File	5	R	
14	JMX_FileTypeFormat	Description of the Format of the File Type	20	O	(3) (10)
15	JMX_FileTypeSrcFlavor	Description of the File Type Source Flavor	20	O	(3) (10)
16	JMX_FileTypeDestFlavor	Description of the File Type Destination Flavor	20	O	(3) (10)
17	JMX_FileTypeContent	Description of the File Type Content	20	O	(3) (10))
18	JMX_FileTypeVersion	Description of the File Type Version	14	O	(3) (10)
19	IDX_DfisSourceCage	CAGE Code of The Originator of The DFIS Data Set	5	R	(3)
20	IDX_FileName	File Name of Image File (without extension)	8	R	(8)
21	IDX_FileExtension	File Extension of Image File	3	R	(8)
22	IDX_FilePath	File Path Where Image File is Located	242	R	(8) (9)
23	IDX_MediaVolumeID	Media Volume ID of Media Where File is Located	11	R	(8)
24	IDX_MajorGroup	Major Group Designation Within Index	20	O	
25	IDX_MinorGroup	Minor Group Designation Within Index	8	O	
26	JMX_SecurityLevel	Security Level	1	R	e.g. "N"
27	JMX_Rights	Viewing Rights	1	R	e.g. "U"
28	JMX_ForeignSecure	Indicates if Foreign Personnel May View the Drawing	1	R	e.g. "N"
29	JMX_Nuclear	Indicates if Drawing Contains Nuclear Equipment	1	R	e.g. "N"
30	JMX_Subsafe	Indicates if Critical Safety	1	R	e.g. "N"
31	JMX_AirType	Model/Device	6	O	
32	JMX_Apl	Allowance Parts List	35	O	
33	JMX_CadInfo	Computer Aided Design Reference	2	O	
34	JMX_ControlCode	Activity Code Furnished by Procuring Activity	2	O	
35	JMX_Hsc	Hierarchical Structure Code	12	O	
36	JMX_Nsn	National Stock Number	13	O	
37	JMX_Uic	Unit Identification Code	5	O	
38	JMX_System	Associated Equipment/System Group	32	O	
39	JMX_Nomenclature	Name of Equipment Described in the Drawing	20	O	
40	JMX_ShipClass	Ship Classification	4	O	
41	JMX_ShipTypeHullNum	Ship Type/Hull Number Classification	9	O	
42	JMX_MasterLocation	Engineering Drawing Master Location	30	O	
43	JMX_OfflineLocation	Engineering Drawing Off-line Location	80	O	
44	JMX_ParentCage	CAGE of Parent Drawing	5	O	
45	JMX_ParentDocNumber	Drawing Number of Parent Drawing	32	O	

46	JMX_PartNumber	Identifies Associated Part Number With CAGE	32	O	
47	JMX_SubSheet	Further Identifies Sheet	3	O	
48	JMX_Succeeding	Drawing Number and CAGE of Superseding Drawing	20	O	
49	JMX_DistStmt	Distribution Statement	2	O	
50	JMX_AccDocType	Accompanying Document - Document Type	2	R	(5) (13)
51	JMX_AccDocNumber	Accompanying Document - Document Number	32	R	(5) (13)
52	JMX_AccDocCage	Accompanying Document - CAGE Code	5	R	(5) (13)
53	JMX_AccDocRevision	Accompanying Document - Document Revision	2	O (4)	(5) (13)
54	[Blank]	[This Field Reserved For Future Use]	0	O	
55	[Blank]	[This Field Reserved For Future Use]	0	O	
56	JMX_WeaponsSystemCode	Weapon System Code	15	O	
57	IDX_DfisVersion	Version of the DFIS Structure Implemented	4	R (14)	"1.0"
58	Record End	Indicate end of record CR/LF (Hex 0D0A)	2	R	

NOTE:

1. For the most recent instructions and explanations of the **JEDMICS Compact Disk Engineering Data Exchange (CDEX)** file structure, data elements and the process to use in applying them to the converted files, users are encouraged to reference the JEDMICS website.
2. JEDMICS provides "CDEX Tools," two programs recommended for use in creating the index file structure. IndexR and ImageR are Government owned programs for use with CDEX. They are also helpful in indexing ADCS and Product Data elements. Current versions are also available from the U.S. Army JEDMICS Component Office and on the EDMS PMO website.

DFIS Seq	ADCS Metadata File Structure		Max Data # Chars	Required or Optional	Notes
	DATA ELEMENT	Purpose			
59	ADC_ConversionProjName	Name of Task or Project	242	O	
60	ADC_ContractNumber	Of ADCS SOW (PII number)	19	O	
61	ADC_AuthorizingActivity	Govt authorizing entity	242	O	
62	ADC_AuthActPOC	Govt Point of Contact	35	O	
63	ADC_ConversionContractor	From SOW	50	R	
64	ADC_ConverContractorAddr	Mailing Address of Contractor	242	O	
65	ADC_ContractorPOC	Contractor Point of Contact	35	R	
66	ADC_ConverContractorEmail	email Address of Contractor	25	O	
67	ADC_ConversionDate	Completion Date per Sheet (dd/mm/yyyy)	10	R	
68	ADC_ConvertedByName	Contractor Operator Name	35	O	
69	ADC_CheckedByName	Contractor Internal Check Name	35	O	
70	ADC_OutputMedia	Type of Media Used to Deliver Files	20	O	
71	ADC_DetailedDefinitionPkg	ADCS Det Def Pkg Requirements Used	25	R	
72	ADC_OutputFileFormat	Digital Format Used in Conversion	20	O	
73	ADC_ConversionType	One of the Twelve Types of Conversion	25	O	
74	ADC_SoftwareUsed	Product Name and Manufcturer	242	O	
75	ADC_SoftwareVersion	Product versio or revision	10	O	
76	ADC_ValidationDate	Date File Validation is Appr by Govt. (dd/mm/yyyy)	10	O	
77	ADC_ValidationProcessUsed	Process ie: test, inspect, demonstrate, analyze	12	O	
78	ADC_ValidationByName	Name of Person Validating File	35	O	
79	ADC_ValidationByContractor	Name of Contractor (if any) Validating File	50	O	
80	ADC_ValidationPOC	Validation-Point of Contact	35	O	
81	ADC_ValidatorsEmail	email of Validator	25	O	
82	ADC_Backend ApprovalBy	Final Approval Name after Validation process	35	O	
83	ADC_Backend ApprovalDate	Date File Validation is Appr- Backend(dd/mm/yyyy)	10	O	
84	ADC_BackendApprovalPOC	Point of Contact for Backend Approval	35	O	
85	ADC_BackendApprovalEmail	email of Backend Approval Person	25	O	
86					
87					
88					
89					
90					
91					
92					
93					
94					
95					
96					
97					
98					
99	ADC_NotesComments	Notes and Comments Specific to Conversion	242		
100	ADC_RecordEnd	End ADCS Index Data	2	X	

DFIS Seq	Product Data Metadata File Structure		Max Data # Chars	Required or Optional	Notes
	DATA ELEMENT	Purpose			
101	PD_PartNumber	As represented on Drawing	242	O	
102	PD_ContractNumber	Original Contract Number for Part	19	O	
103	PD_ContractorName	From Drawing Title Block	242	O	
104	PD_EngineerName	From Drawing Title Block	35	O	
105	PD_DateDrawn	From Drawing Title Block	10	O	
106	PD_DateLastRev	From Drawing Title Block (dd/mm/yyyy)	10	O	
107	PD_NameLastRev	From Drawing Title Block (dd/mm/yyyy)	35	O	
108	PD_DwgApprovalName	From Drawing Title Block	35	O	
109	PD_DesignApprovalName	From Drawing Title Block	35	O	
110	PD_MaterEngineerName	From Drawing Title Block	35	O	
111	PD_NHPartNumber	From Drawing Title Block		O	
112	PD_PartRevision	From Drawing Title Block		O	
113	PD_Part_Cave	From Drawing Title Block		O	
114	PD_NH_PartNum	From Drawing Title Block		O	
115	PD_NH_PartRev	From Drawing Title Block		O	
116	PD__Part_Cave	From Drawing Title Block		O	
117	PD_				
118	PD_				
119	PD_				
120	PD_RecordEnd	End Product Data Index Data	2	R	

20.0 APPENDIX H Document Conversion Strategy SHIPPING FORM

<table>
<tr><td>WEAPON SYSTEM</td><td colspan="3" rowspan="2">Document Conversion Strategy
SHIPPING FORM</td></tr>
<tr><td>CONTRACT NUMBER</td></tr>
<tr><td>ORGANIZATION NAME</td><td>SHIPMENT DATE
99-01-01</td><td>SHIPMENT ID</td><td>SHIPMENT METHOD</td></tr>
<tr><td>ORGANIZATION ADDRESS</td><td>LOT NUMBER</td><td colspan="2">QUANYITY OF DRAWING SHEETS SHIPPED</td></tr>
<tr><td>POC NAME</td><td>SECURITY CLASSIFICATION</td><td colspan="2">QUANTITY OF ASSOCIATED DATA SHEETS SHIPPED</td></tr>
<tr><td colspan="4">ORGANIZATION COMMENTS:</td></tr>
<tr><td colspan="4">CONTRACTOR COMMENTS</td></tr>
<tr><td>CONTRACTOR NAME</td><td rowspan="2">RECEIVED BY</td><td colspan="2" rowspan="2">DELIVERY DATE</td></tr>
<tr><td>CAGE CODE</td></tr>
<tr><td rowspan="2">CONTRACTOR ADDRESS</td><td>LOT NUMBER RECEIVED</td><td colspan="2">DELIVERY TIME</td></tr>
<tr><td rowspan="2">CONTRACTOR POC</td><td colspan="3" rowspan="2">QUANTITY OF DRAWING SHEETS RECEIVED</td></tr>
<tr><td>CONTRACTOR EMAIL</td></tr>
<tr><td colspan="4">QUANTITY OF ASSOCIATED DATA SHEETS RECEIVED</td></tr>
</table>

21.0 APPENDIX I Document Conversion Strategy DELIVERABLES SCHEDULES

WEAPON SYSTEM	**Document Conversion Strategy DELIVERABLES SCHEDULE**	
CONTRACT NUMBER		
ORGANIZATION NAME	SECURITY CLASSIFICATION	DATE
ORGANIZATION ADDRESS	POC NAME	POC EMAIL

DELIVERABLES			
	CONTRACT DATE	ACTUAL DATE	INITIALS
Initial Block delivered to contractor			
First Article Block Delivery Date			
If First Article Block Returned from Contractor			
Validation of First Article Block			
First Article Block Delivered			
First Article Block Returned			
Subsequent Lot Delivered			
Subsequent Lot Delivered			
Post Production Audit			

Contractor Signature	Program Manager Signature

CONTRACTOR NAME	CONTRACTOR CAGE	CONTRACTOR POC
CONTRACTOR ADDRESS		CONTRACTOR EMAIL

22.0 APPENDIX J Document Conversion Strategy FIRST ARTICLE VALIDATION FORM

WEAPON SYSTEM	**Document Conversion Strategy FIRST ARTICLE VALIDATION FORM**		
CONTRACT NUMBER			
ORGANIZATION NAME	SHIPMENT DATE 99-01-01	SHIPMENT ID	SHIPMENT METHOD
ORGANIZATION ADDRESS	BLOCK NUMBER	RECEIVED BY	
POC NAME	SECURITY CLASSIFICATION	DATE RECEIVED	

FIRST ARTICLE VALIDATION INFORMATION			
Did this Block produce a successful First Article conversion?		YES	NO
Validated by	Approved by		
Is the First Article rejected?		YES	NO
Reason for rejection (attach extra sheet if necessary)			
IF first attempt rejected: Date Second Attempt resent to contractor		Date second attempt returned from contractor	
Did Second Attempt meet required specification?		YES	NO
Is Second Attempt validated?			
Validator's Name			
Approved by	Approval date		

CONTRACTOR NAME	CAGE CODE	BLOCK NUMBER SENT
CONTRACTOR ADDRESS	QUANTITY OF FIRST ARTICLE DRAWING SHEETS SHIPPED	
CONTRACTOR POC		
CONTRACTOR EMAIL	QUANTITY OF FIRST ARTICLE ASSOCIATED DATA SHEETS SHIPPED	

23.0 APPENDIX K VALIDATION METHODS AND SIGNOFF SHEET

The Program Manager uses at least one of four appropriate validation methods for the type of documents being converted. **Demonstration**, **Inspection**, **Analysis** and/or **Test** is used to determine that the conversion process meets contractual requirements. The results of these activities provide metrics used to define an acceptable product and to verify contractor compliance.

Until a level of confidence has been established, a higher number of the documents within a block should be verified. More of the converted First Article Block should be verified than in subsequent lots when a level of confidence has been established.

23.1 Demonstration

The contractor demonstrates capabilities that meet the Performance Specification requirements for the task prior to contract award. The Program Manager selects a test set of representative engineering documents and through demonstration ensures the qualification of the potential contractor to perform the required document conversion.

23.2 Inspection

Efficient inspection prior to, during, and after the conversion process ensures that the contractor continues to work at an acceptable quality level. Conversion inspection includes, at a minimum, visual examination of a sample of converted documents. This will determine if the baseline conversion requirement has been met. Inspection assists Program Managers in determining if the contractor included the required metadata, converted to the proper format, and is providing the accuracy required. Concerns about optional metadata may be addressed through Inspection.

23.3 Analysis

Program Managers employ analysis to ensure the conversion processes are complete and accurate. The analysis processes includes input to engineering target systems to test the functionality of the converted data. The validation activity uses analysis to determine that the converted information is accurate, that no information content was lost or altered in the conversion process, and that the functional requirements specified by the Performance Specification were achieved.

23.4 Standard Compliant Software

Program Managers should only consider software which employ document/data formats in conformance with Industry, International, or Military standards. Verification that COTS

(Commercial Off The Shelf) software used in the conversion process meets the standards is required. Program Managers should use existing DoD evaluation or should secure the services of an independent vendor to perform testing and provide evaluations.

23.5 Test

Test is a Validation tool that measures, records, and evaluates qualitative and quantitative data obtained during a controlled operation of the conversion process against procurement specifications. Program Managers employ testing where the technical information provided in the conversion can be evaluated against a set of criteria. Information to evaluate correctness, accuracy or precision in the conversion is compiled.

The Validation Sign-off Sheet is on the following page.

23.6 Document Conversion Strategy Validation Sign-Off Form

WEAPON SYSTEM CONTRACT NUMBER	**Document Conversion Strategy VALIDATION SIGN-OFF FORM**		
ORGANIZATION NAME	SHIPMENT DATE 99-01-01	SHIPMENT ID	SHIPMENT METHOD
ORGANIZATION ADDRESS	LOT NUMBER	RECEIVED BY	
POC NAME	SECURITY CLASSIFICATION	DATE RECEIVED	

VALIDATION INFORMATION				
Conversion Type	Conversion Format	Software Used (including Version)		
Did this lot produce a successful conversion?		YES	NO	
If successful, Validated by	If successful, Approved by			
Is this lot rejected?		YES	NO	
Reason for rejection				
Will information be resubmitted to contractor?	YES	NO	Date resubmitted to contractor	
Did resubmitted information meet required specification?		YES	NO	
Is resubmitted information validated?				
Validator's Name				
Approved by	Approval date			

CONTRACTOR NAME	CAGE CODE	LOT NUMBER SENT
CONTRACTOR ADDRESS	QUANTITY OF DRAWING SHEETS SHIPPED	
CONTRACTOR POC		
CONTRACTOR EMAIL	QUANTITY OF ASSOCIATED DATA SHEETS SHIPPED	

24.0 APPENDIX L VALIDATION TABLES

WEAPON SYSTEM	CONTRACT NUMBER	**Document Conversion Strategy MECHANICAL VALIDATION TABLE**
ORGANIZATION	DATE	

	Drawing Type				Drawing Type		
REQUIREMENT	2D CC	2D CP	3D CP	**REQUIREMENT**	2D CC	2D CP	3D CP
General Requirements				Leader Lines			
File Intelligence				ARC/Circle Leader Lines			
Line Styles			n/a	Geometric Tolerance Symbols			
Symbol Libraries				Diameter References			
Extraneous Markings				Dimension Variables			
Information Transfer				DIM TEXT			
Revision Histories				Moving Dimensions			
Revision Block				Text Style			
Dates				Case			
Revision Balloons				Legibility			
SQAP's and QAR's				Justification			
Text Size				Width			
Sheet Size				Heights			
Assembly Drawings				Spacing			
Title Blocks				CAGE			
Indexing				Contractor Information			
Military Specification Drawings				Material Engineer's Stamp			
XREF's				Multiple Signatures			
Illegible Items				Signatures			
Drawing Protection				FSCM			
Quality Assurance Process				Code Identification Numbering			
Data Outside Border				Scale Notes Renaming			
Disposition of Originals				Title Block			
JEDMICS C4 DPI				Justification			
Layering and Color				Order of Notes			
Dimensionality				Initial Note			
Threads				Spacing of Notes			
Line Width				Additional Notes			
Bilateral Tolerances				Precious Metal Indicator Code (PMIC)			
Drawing Scale				Physical Properties			
Title Block Scale				Current Notes			
JEDMICS C4 Scale				Unnumbered Notes			
LTSCALE				Parts List			
Hatching			n/a	Drawing Standard			
Attributed Blocks				Conversion			
Explode Blocks							
DIM-CEN							
DIMCEN Tolerance							
Circle Centerlines							
Converted Dimensions							
Association							

I – Inspection D – Demonstration T – Test A – Analysis n/a – Not applicable

WEAPON SYSTEM	CONTRACT NUMBER	**Document Conversion Strategy ELECTRICALVALIDATION TABLE**
ORGANIZATION	DATE	

REQUIREMENT	Drawing Type 2D CC	2D CP	SC MA	REQUIREMENT	Drawing Type 2D CC	2D CP	SC MA
General Requirements				DIMCEN Tolerance			n/a
File Intelligence				Circle Centerlines			n/a
Line Styles				Converted Dimensions			n/a
Title Blocks				Association			n/a
Symbol Libraries				Leader Lines			n/a
Extraneous Markings				ARC/Circle Leader Lines			n/a
Information Transfer				Geometric Tolerance Symbols			n/a
Revision Histories				Diameter References			n/a
Revision Block				Dimension Variables			n/a
Dates				DIM TEXT			n/a
Revision Balloons				Moving Dimensions			n/a
SQAP's and QAR's				Text Style			
Index Information	n/a			Case			
Text Size				Legibility			
Sheet Size				Justification			
Conversion Format	n/a	n/a		Width			
Assembly Drawings			n/a	Heights			
Title Blocks				Spacing			
Indexing				CAGE			
Military Specification Drawings				Contractor Information			
XREF's				Electrical Engineer's Stamp			
Illegible Items				Multiple Signatures			
Drawing Protection				Signatures			
Quality Assurance Process				FSCM			
Data Outside Border				Code Identification Numbering			
Disposition of Originals				Scale Notes Renaming			
JEDMICS C4 DPI				Title Block			
Layering and Color				Justification			
Dimensionality				Order of Notes			
Reference Designators	n/a	n/a		Initial Note			
Threads	n/a		n/a	Spacing of Notes			
Line Width				Additional Notes			
Bilateral Tolerances			n/a	Precious Metal Indicator Code (PMIC)			
Drawing Scale				Physical Properties			
Title Block Scale				Current Notes			
JEDMICS C4 Scale				Unnumbered Notes			
LTSCALE				Parts List			
Hatching				Drawing Standard			
Attributed Blocks				Conversion			
Explode Blocks							
DIM-CEN			n/a				

I – Inspection D – Demonstration T – Test A – Analysis n/a – Not applicable

WEAPON SYSTEM	CONTRACT NUMBER	**Document Conversion Strategy AEC VALIDATION TABLE**
ORGANIZATION	DATE	

	Drawing Type					Drawing Type		
REQUIREMENT	2D CC	2D CP	SC MA	**REQUIREMENT**	2D CC	2D CP	SC MA
General Requirements				Circle Centerlines		n/a	
File Intelligence				Converted Dimensions			
Geometric Representation	n/a	n/a		Association			
Line Styles			n/a	Leader Lines			
Title Blocks				ARC/Circle Leader Lines			
Symbol Libraries				Diameter References			
Extraneous Markings				Dimension Variables			
Information Transfer				DIM TEXT			
Revision Histories				Moving Dimensions			
Revision Block				Text Style			
Dates				Case			
Revision Balloons				Legibility			
SQAP's and QAR's				Justification			
Text Size				Width			
Sheet Size				Heights			
Assembly Drawings				Spacing			
Title Blocks				CAGE			
Indexing				Contractor Information			
Military Specification Drawings				AEC Engineer's Stamp			
XREF's				Multiple Signatures			
Illegible Items				Signatures			
Drawing Protection				FSCM			
Quality Assurance Process				Code Identification Numbering			
Data Outside Border				Scale Notes Renaming			
Disposition of Originals				Title Block			
JEDMICS C4 DPI				Justification			
Layering and Color				Order of Notes			
Dimensionality				Initial Note			
Line Width				Spacing of Notes			
Bilateral Tolerances		n/a		Additional Notes			
Drawing Scale		n/a		Current Notes			
Title Block Scale				Unnumbered Notes			
JEDMICS C4 Scale				Drawing Standard			
LTSCALE				Conversion			
Hatching		n/a					
MicroStation			n/a				
AutoCAD			n/a				
Attributed Blocks							
Explode Blocks							
DIM-CEN		n/a					
DIMCEN Tolerance		n/a					

I – Inspection D – Demonstration T – Test A – Analysis n/a – Not applicable

WEAPON SYSTEM	CONTRACT NUMBER	**Document Conversion Strategy MAPPING (GIS) VALIDATION TABLE**
ORGANIZATION	DATE	

	Drawing Type					Drawing Type		
REQUIREMENT	2D CC	2D CP	SC MA	**REQUIREMENT**	2D CC	2D CP	SC MA

25.0 APPENDIX M Time and Materials Delivery Form Letter

Project Manager: Address: E-mail: Telephone:	**Document Conversion Strategy Time & Materials Delivery Order** Weapon System: Date:

Time & Materials Delivery Order

This First Article Request contains _____(#) of _____size drawings existing in _____format. The drawings are to be converted into_____ Detailed Definition Package, using _____output format.

The Delivery Method of the converted First Article Block will be _____ and disposition of the original documents will be _____.

Notification of receipt of this First Article Block is requested through electronic mail and will be addressed to the Government POC, address above. Post conversion, the document block will be returned to the Government POC with the Certificate of Current Cost or Pricing Data and the Price Per Sheet information below completed. Notification of contract award will follow a comprehensive verification process, based upon the specific requirements listed in the accompanying Detailed Definition Package.

Certificate of Current Cost or Pricing Data

This is to certify that, to the best of my knowledge and belief, the cost or pricing data (as defined in section 15.401 of the Federal Acquisition Regulation (FAR) and required under FAR subsection 15.403-4) submitted, either actually or by specific identification in writing, to the Contracting Officer or to the Contracting Officer's representative in support of _____* are accurate, complete, and current as of _____**. This certification includes the cost or pricing data supporting any advance agreements and forward pricing rate agreements between the offeror and the Government that are part of the proposal.

Contractor Information	
Firm	
Signature	
Name	
Title	
Date of execution***	

* Identify the proposal, request for price adjustment, or other submission involved, giving the appropriate identifying number. (e.g., RF No.)

** Insert the day, month, and year when price negotiations were concluded and price agreement was reached or, if applicable, an earlier date agreed upon between the parties that is as close as practicable to the date of agreement on price.

*** Insert the day, month, and year of signing, which should be as close as practicable to the date en the price negotiations were concluded and the contract price was agreed to.

Price Per Sheet (by Functional Type and Sheet Size)										
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**
Functional Type										

26.0 Appendix N Engineering Release Record (ERR)

ENGINEERING RELEASE RECORD

1. ERR NO.	2. DATE	3. SHEET OF SHEETS

BASELINE ESTABLISHED OR CHANGED

☐ FUNCTIONAL ☐ ALLOCATED ☐ PRODU

5. TYPE OF RELEASE	6.
☐ INITIAL ☐ CHANGE	ECP NO. _____
	DATE APPROVED_____

7. FUNCTIONAL ASSEMBLY NOMENCLATURE

8. SYSTEM OR CONFIGURATION ITEM NOMENCLATURE

9. REMARKS MISCELLANEOUS

10. DATA RELEASED OR REVISED

	DOCUMENT				REVISION		H RELEASE		i CHANGE		OTHER
CODE ID	b.TYPE	c.NUMBER	d SH OF SHEETS e		f LTR	G DATE	IR	NAR	CH	CAN	

11. SUBMITTED BY	DATE	12. APPROVED BY

STA 7123

Engineering Release Record (continued)

ENGINEERING RELEASE RECORD
Continuation Sheet

ERR NO.	DATE	SHEET OF SHEETS

a.	DOCUMENT				REVISION		h RELEASE		i CHANGE		OTHER
CODE ID	b.TYPE	c.NUMBER	d SH OF SHEETS	e	f LTR	g DATE	IR	NAR	CH	CAN	